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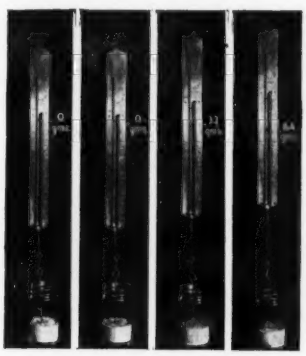

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[1] Morse and Talbot: Diseases of Nutrition and Infant Feeding, pg. 59.

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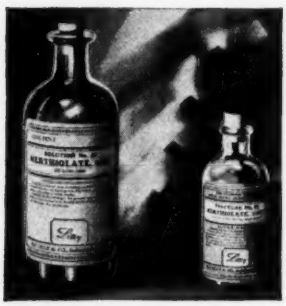

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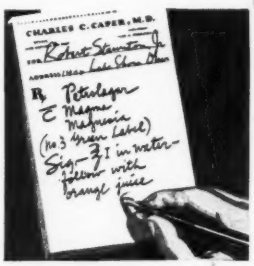

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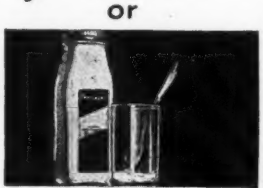

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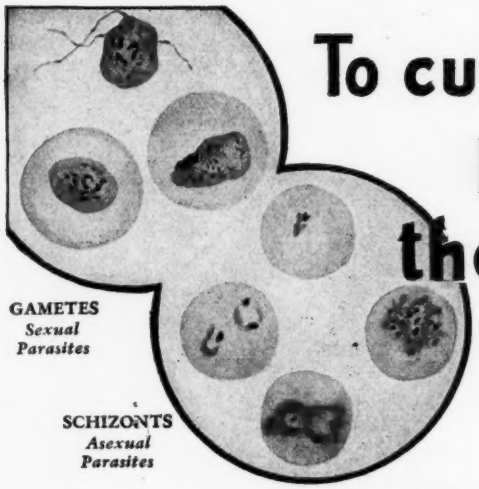

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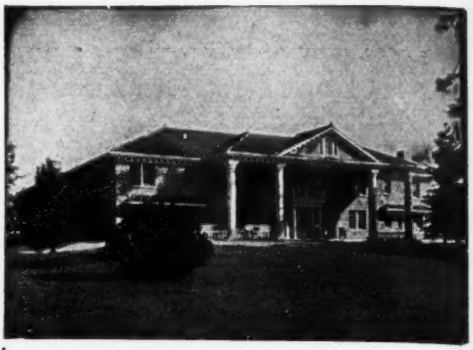

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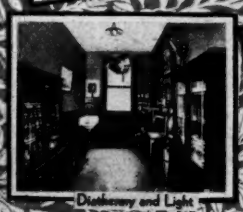
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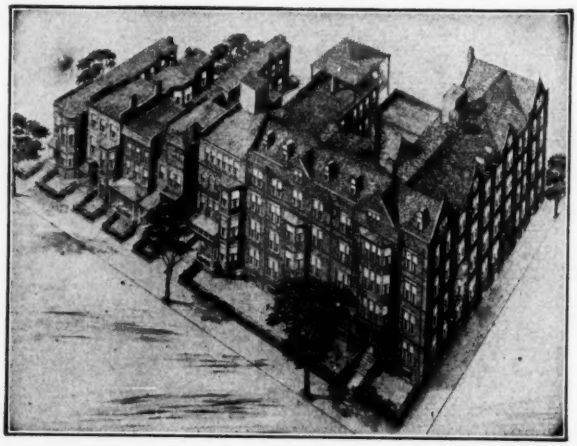

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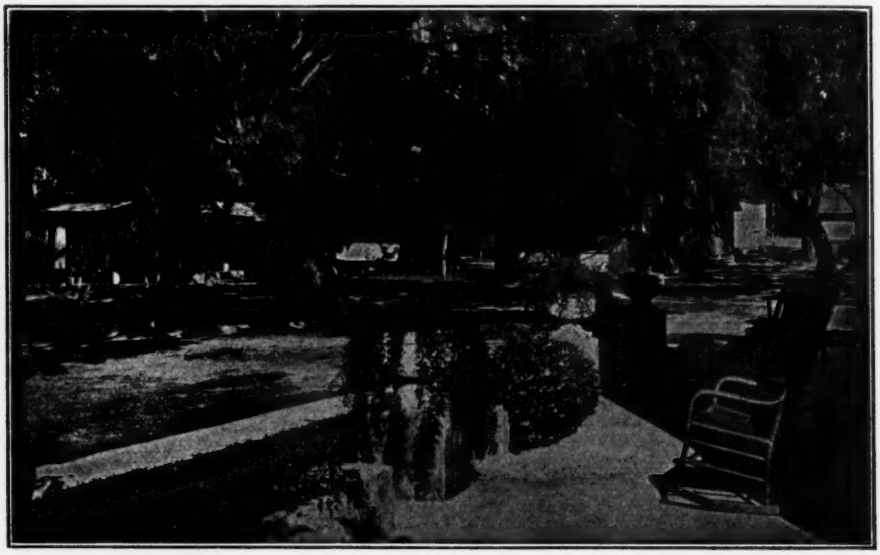

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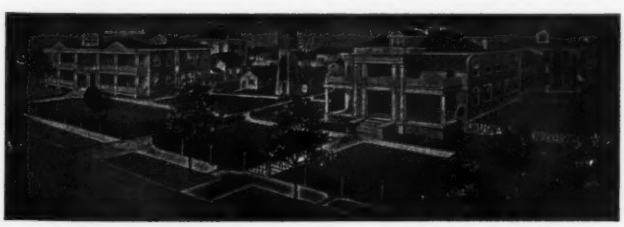

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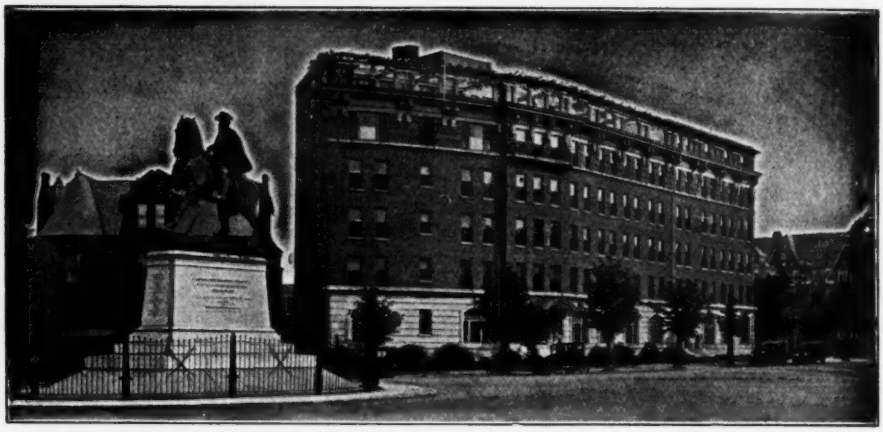

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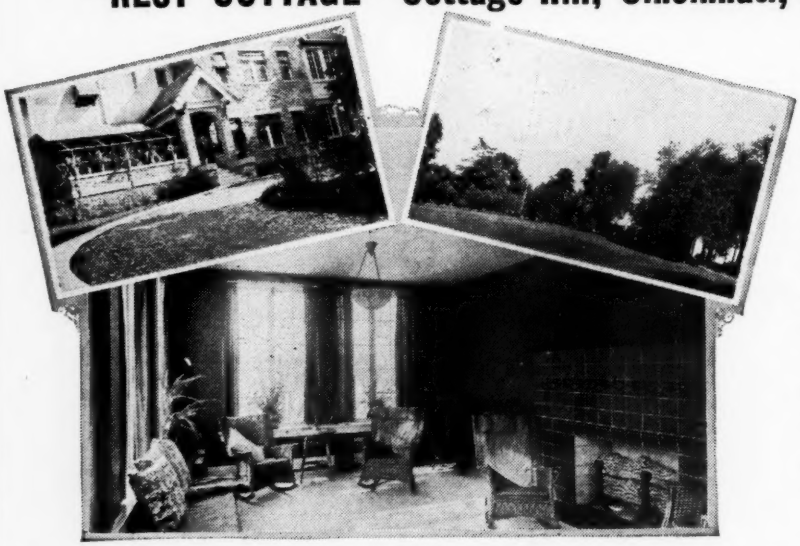

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Volume XXV AUGUST 1932 Number 8

WOUNDS OF THE HEART AND PERICARDIUM*

A REPORT OF CASES AND A SUMMARY OF THE LITERATURE OF SUTURED HEART WOUNDS

By I. A. BIGGER, M.D.,
Richmond, Va.

Wounds of the heart and pericardium occur more frequently than is realized, but are not often treated by surgeons, as they may be immediately fatal and, if not, are difficult to diagnose. However, it is important that surgeons be familiar with the indications for operation and the technic employed in such cases. They may be divided into three groups according to the type and extent of the injury. *Group 1* includes those cases with injury to the pericardium alone or with injury to the pericardium plus injury to the heart wall without penetration of the cardiac chambers or divisions of important coronary vessels. Wounds of this type are difficult to diagnose, but fortunately they usually show satisfactory progress without surgical intervention. The most frequent complication is infection, which gives rise to characteristic symptoms and signs. *Group 2* includes those cases with such severe injury that death occurs before surgical aid can be given. Gunshot and other perforating wounds are apt to fall into this group. *Group 3* includes those with penetration of the cardiac chambers or injury to branches of coronary arteries. In most of these blood is trapped in the pericardial sac, producing heart tamponade, which leads to circulatory failure unless promptly relieved. The diagnosis in this group is less difficult, and favorable results are obtained by surgical treatment. Stab wounds are usually of this type. In some cases, however, the opening between the pericardium and pleural cavities is large enough to permit constant leakage of blood, thereby preventing heart tamponade and making the diagnosis difficult. Even though a definite diagnosis cannot be made, if the wound is in the cardiac area and there is evidence of continued intrathoracic hemorrhage, immediate exploratory thoracotomy is indicated.

*Read in Section on Surgery, Southern Medical Association, Twenty-Fifth Annual Meeting, New Orleans, Louisiana, November 18-20, 1931.

*From the Department of Surgery, Medical College of Virginia.

DIAGNOSIS

The diagnosis of wound of the pericardium is difficult unless there is an associated wound of the lung with a resulting pneumopericardium, or a wound of a vessel with an accumulation of blood in the pericardial cavity. Wound of the heart is also difficult to diagnose unless there is an associated hemopericardium producing heart tamponade. The symptoms and signs resulting from this condition are low blood pressure, weak and rapid pulse, pallor, cold skin, and distant and muffled heart sounds. Respiratory distress is also a prominent symptom. The occurrence of these symptoms associated with an injury in the cardiac area should be considered an indication for immediate surgical intervention.

ANESTHETIC AND OPERATIVE TECHNIC

A number of cases of heart wound have been operated upon without an anesthetic. This is unnecessary and unwise, for even though the patient is unconscious when the operation is begun, consciousness is apt to return upon release of the intrapericardial pressure. If a transpleural approach is to be used, a general anesthetic administered under slightly positive pressure is preferable; but if an extrapleural approach is planned, a local anesthetic is entirely satisfactory.

Some type of transpleural approach has been used in the majority of reported cases. Recently a number of surgeons, notably Cutler and Beck, have advocated the midsternal approach, which they claim gives a better exposure of the entire heart than can be obtained by any other incision and without additional shock. The author prefers an extrapleural approach by

resection of two (the fourth and fifth) or more costal cartilages on the left side, resection of a part of the left side of the sternum, and lateral retraction of the left pleura. This gives an adequate exposure of the heart without opening the pleura. It can be carried out easily under local anesthesia and gives ready access to the left pleural cavity if for any reason this seems necessary. Whatever type of incision is used, it is essential that a good exposure be obtained before the pericardial cavity is opened, as severe hemorrhage is apt to occur when the pressure on the heart is released, which may be difficult to control if the exposure is inadequate.

The apical traction suture advocated by Beck is of great assistance both in the control of hemorhage and in the application of approximating sutures. The type of suture material is probably of little importance, but silk has certain definite advantages over catgut, as it is less apt to become untied or to undergo disintegration in case of infection. Interrupted sutures are preferable in an organ which constantly changes shape and volume, as does the heart. They should not penetrate the endocardium and should be tied only tightly enough to secure approximation and control hemorrhage.

The question of drainage of the pericardium has not been settled. It is perhaps unwise to introduce irritating drainage material into the pericardial cavity, but it is important that exit be given to the fluid which is almost certain to accumulate as the result of operative trauma. This can be accomplished by closing the pericardium with widely separated interrupted sutures or by leaving an opening of considerable size in the lower portion of the incision.

COMPLICATIONS AND PROGNOSIS

The most frequent postoperative complications are infection, pulmonary infarction, and cardiac tamponade. Infection is to be expected in a considerable number of cases, as the wounds are usually made by dirty instruments. This percentage, however, can be decreased by using the best aseptic technic and by care in handling tissues. Too great stress has been placed upon the necessity for rapid exposure of the heart, with the result that these important measures are frequently neglected. It is desirable to use the same care in preparing the field and in handling tissues as is used in other operations, unless the patient's condition becomes so alarming as to necessitate a rapid exposure. If such an emergency should develop, the heart can be exposed in a very short time at any stage of the operation by a transpleural incision. An unusual degree of speed is not necessary in the average case until the pericardial sac is opened.

Cardiac tamponade can be prevented by leaving the pericardium partly open or by aspiration.

The prognosis depends not only on the type of injury, but also on the promptness with which surgical aid is given.

In 1868 Fischer collected 452 untreated cases of heart wound and found that only 10 per cent recovered. In 1909, Peck collected 160 cases treated surgically with 36.87 per cent recoveries. In 1912, Pool added 77 cases with 54.5 per cent recoveries. Smith collected 49 cases occurring between 1912 and 1923, of which 71.44 per cent recovered. Schoenfeld collected 25 cases between 1923 and 1926, of which 64 per cent recovered. Since Schoenfeld's report we have been able to collect 53 cases of heart wound treated by suture with 73.5 per cent recoveries.

The percentage of recoveries is probably not so high as indicated by the more recent figures, as reports of heart suture are not unusual and only those who have had successful cases are apt to make reports. However, the results from such operations are improving and the chances for recovery are much greater in those receiving surgical treatment than in the untreated.

We have attempted to collect all cases of wound of the heart operated upon and reported since 1926. These are presented in the following tables. The cases included in *Tables 1, 2* and *3* had relatively complete data and were used in estimating the percentage of recoveries. Three cases in *Table 4* were also used, but in the remaining 6 cases the data was insufficient. The cases in *Table 5* were collected from the Russian literature by Mukhadze. Only those operated upon since 1926 were used in estimating the percentage of recoveries. The cases listed in *Table 6* were operated upon and reported before 1926, but had not been previously collected. They are given here to bring the literature up to date, but were not used in estimating the percentage of recoveries.

CASE REPORTS

We wish to report a case of bullet wound of the pericardium which recovered without surgical intervention and one with a bullet wound of the wall of the left ventricle associated with other serious thoracic and abdominal injuries, which died as a result of massive intrathoracic hemorrhage. We also wish to report two cases of wound of the heart treated by suture with recovery of both.

Case 1.—G. T., a colored man 22 years of age, was admitted to the Saint Philip Hospital on November

24, 1930, a short time after receiving gunshot wounds of the left chest, left forearm, and right thigh. At the time of admission he was moderately shocked and was complaining of pain in the left side of the chest and abdomen. His systolic blood pressure was 105 mm. Hg.

The wound of entrance into the thorax was located in the left fourth interspace about 2 cm. within the nipple line. The bullet had coursed backward, downward, and slightly outward and had passed through the posterior wall at approximately the level of the upper pole of the left kidney. There was slight subcutaneous emphysema around the wound of entrance, but none around the wound of exit. There was a small amount of air and some blood in the left pleural cavity and the heart sounds were somewhat distant, presumably because of the pneumothorax. The mediastinum was displaced to the right. The abdomen was tender in the left upper quadrant, but there was neither free air nor fluid in the peritoneal cavity. The patient was put to bed with the foot of the bed elevated and was given morphine (gr. ¼). In spite of the fact that there was only a moderate hemorrhage into the pleural cavity, his systolic blood pressure fell to 90 mm. Hg.

Six hours after admission a peculiar splashing sound was discovered over the precordium synchronous with the heart beat. This was interpreted as indicating the presence of blood and air in the pericardial sac; but the blood pressure was rising at this time, so it was concluded that there was no serious cardiac injury. The following morning his systolic pressure was 120 mm. Hg. X-ray examination 18 hours after admission showed pneumopericardium and 28 hours after admission a definite pericardial friction rub was noted. At this time the patient's abdomen was considerably distended and generally tender, but there was still no evidence of free air or fluid in the peritoneal cavity. There was a moderate elevation of temperature for two weeks, but he did not develop signs of fluid in the pericardial sac. An x-ray examination of the chest on December 2, eight days after admission, did not show air in the pericardial cavity. Obviously the bullet penetrated the lung and then the pericardium and the air escaped from the lung and followed the path of the bullet.

Case 2.—G. A., a white man 27 years of age, was admitted to the Memorial Hospital on November 13, 1930, a short time after shooting himself in the left side of the chest. He was severely shocked; his systolic blood pressure was only 60 mm. Hg. and his pulse was rapid and of poor quality. He was pale and his skin was cold and clammy. Examination of the chest showed the wound of entrance in the left fifth interspace just outside the nipple line. The bullet had

Table 1

TABLE OF WOUNDS OF RIGHT VENTRICLE

No.	Surgeon	Year Reported	Type of Wound	Duration Before Operation	Anesthetic	Type of Thoracotomy	Drainage of Pericardium	Complications	Result
1	Allen, C. W.	1928	Stab	?	General	Trapdoor	Yes	?	Death in 24 hrs.
2	Bigger, I. A.	1931	Stab	6 hrs	Local	Resection of costal cartilages and left half of sternum	No	Slight wound infection	Recovery 58 days
3	Boltjes	1928	Perforating	1½ hrs	?	Resection of costal cartilages	No	None	Recovery
4	Cox, D. M.	1928	Bullet	3 hrs	?	Midsternal section	No	?	Death in 24 hrs.
5	Cox, D. M.	1928	Stab	2½ hrs	Local	Resection of costal cartilages	No	?	Recovery 116 days
6	Doughty, R. G.	1929	Stab	2 hrs	Ether	Trapdoor	No	?	Recovery 40 days
7	Naegeli	1928	Stab	17 hrs	Ether	Resection of costal cartilages	No	Pneumonia	Recovery 60 days
8	Nather	1927	Stab	?	?	?	No	?	Recovery 42 days
9	Neuman (reported by Heger)	1926	Bullet	?	?	Trapdoor	?	Pulmonary infarct	Recovery
10	Nissen, R.	1930	Stab	½ hr	Ether	Resection of costal cartilages and portion of sternum	No	Empyema, right	Recovery
11	Pfeiffer	1928	Bullet	1 hr	?	Resection of costal cartilages	Yes	Collection of 500 c. c. of fluid which escaped when drains were removed	Recovery 42 days
12	Seeliger (reported by Wagner)	1926	Stab	1 hr	?	Resection of costal cartilages and sternum	No	?	Death in 1 hour
13	Sherrard, Stephens and Hutchins	1928	Stab	½ hr	Local	Resection of costal cartilages	No	Pleural effusion	Recovery 49 days

Table 2

TABLE OF WOUNDS OF LEFT VENTRICLE

No.	Surgeon	Year Reported	Type of Wound	Duration Before Operation	Anesthetic	Type of Thoracotomy	Drainage of Pericardium	Complications	Result
1	Allen, C. W.	1928	Bullet	?	Gas	Trapdoor	No	None	Recovery 10 days
2	Bates, William	1929	Stab	?	?	Resection of costal cartilages	No	None	Recovery 27 days
3	Bigger, I. A.	1931	Stab	1 hr., 10 min.	Local	Resection of costal cartilages and left half of sternum	No	Slight wound infection	Recovery 16 days
4	Blalock, Alfred	1931	Stab*	?	?	Median sternotomy	Left partly open	None	Recovery
5	Bufalini†	1926	Stab	3 hrs.	Ether	?	Yes	Collection of serosanguinous fluid in left pleural cavity	Recovery 19 days
6	Bufalini	1926	Stab	24 hrs.	Ether	?	Yes	Stab wound of abdomen	Death in 30 hrs.
7	Butler d'Ormond	1928	Stab	½ hr.	None	Trapdoor	?	?	Death in 24 hrs.
8	Butler d'Ormond	1928	Stab	?	None	Trapdoor	?	Empyema, left pleura	Recovery 61 days
9	Cantelmo	1927	Stab	About 15 hrs.	General	Resection of costal cartilages	Yes	?	Death in 48 hrs.
10	Cole, W. H.†	1927	Stab	¾ hr.	Local & ether	Resection of costal cartilages	No	Pericardial tamponade. Pneumonia. Wound infection. Abscess of anterior mediastinum	Recovery 42 days
11	Dalger	1929	Bullet	4 hrs., 50 min.	Ether	Trapdoor	No	?	Death in 4 days
12	Doughty, R. G.	1929	Stab	Over 2 hrs.	Ether	Resection of costal cartilages and portion of sternum	Yes	?	Death in 6 hrs.
13	Fisher, J. L.†	1926	Stab	¾ hr.	Ether	Resection of costal cartilages	No	Pneumonia. Adhesive pericarditis with systolic contraction of chest wall	Recovery 52 days
14	Graves, J. Q.	1929	Stab	About 2 hrs.	?	Trapdoor	Yes	None	Recovery 19 days
15	Jakob	1927	Stab	4 hrs.	Ether	Trapdoor	No	None	Recovery 41 days
16	Kiszty	1931	Stab	¾ hr.	Local	Resection of costal cartilages	No	?	Recovery 90 days
17	Luthi	1926	Bullet	2 hrs.	Local & ether	Intercostal	No	None	Recovery 30 days
18	Moritsch	1930	Bullet	?	General	Resection of costal cartilages	No	600 c. c. of bloody fluid in left pleura at autopsy	Death in 4 days
19	Moritsch	1930	Stab	Over 2 hrs.	Local & general	Resection of costal cartilages	No	None	Recovery 30 days
20	Stocker	1931	Bullet	1¼ hrs.	?	Trapdoor	No	Hemothorax	Recovery 120 days
21	Sudhoff	1928	Stab	?	Ether	Resection of costal cartilages	No	?	Recovery 38 days
22	Von Seemen	1929	Stab	14 hrs.	?	?	?	Gas bacillus infection	Death in 4 days

*Non-penetrating.
†Included in Lockwood's series.

taken a downward and slightly outward course and could be palpated in the left flank about the level of the lower pole of the kidney. Further examination showed evidence of a moderate degree of pneumothorax with a collection of blood in the left pleural cavity. The area of cardiac dullness was apparently not increased and the heart sounds were rather weak but clear. Abdominal examination showed rigidity and marked tenderness in the left upper quadrant.

The patient was put to bed with the foot of the bed elevated and was given morphine (gr. ¼) and atropine (gr. 1/150). His systolic blood pressure gradually rose to 100 mm. Hg. and the pulse volume improved. The heart sounds remained clear, indicating that there was no accumulation of blood in the pericardial cavity. The abdominal signs became more acute and widespread, so a laparotomy was advised and carried out through an upper left rectus incision. The bullet had penetrated the diaphragm, perforated the spleen, inflicted a tangential, non-penetrating wound of the stomach and divided two large vessels in the gastrocolic omentum. It then passed through the outer border of the kidney and lodged beneath the skin. Since no hollow viscera were perforated, the hemorrhage was controlled and the abdomen closed. The following morning his condition was improved, but that afternoon he began having respiratory difficulty and became cyanosed, but his blood pressure and pulse remained good. Late the second night after injury his respiratory difficulty increased and he began expectorating blood-tinged sputum. The following morning his condition was worse; he was dyspneic and cyanotic, but his pulse volume was good and his systolic blood pressure was 120 mm. Hg.; the heart sounds remained clear. His temperature was 101.4° and fine rales could be heard throughout the right lung, so it was thought that he was developing a bronchopneumonia. He died approximately 48 hours after the injury.

Autopsy revealed a fibrinous pericarditis and localized pleuritis. The right pleural cavity was completely ob-

Table 3

TABLE OF WOUNDS OF RIGHT AURICLE

No.	Surgeon	Year Reported	Type of Wound	Duration Before Operation	Anesthetic	Type of Thoracotomy	Drainage of Pericardium	Complications	Result
1	Moritsch	1930	Stab	?	Ether	Resection of costal cartilages and portion of sternum	Yes	?	Death in 3 days

Table 4

TABLE OF MISCELLANEOUS CASES

No.	Surgeon	Year Reported	Type and Position of Wound	Duration Before Operation	Anesthetic	Type of Thoracotomy	Drainage of Pericardium	Complications	Result
1	Gusievas	1929	Stab Pericardium	?	?	?	?	?	Recovery
2	Gusievas	1929	Stab Pericardium	?	?	?	?	?	Death in 10 days
3	Schlomka	1931	Stab. Probably both ventricles. Injury left coronary artery(?)	1 hr.	?	Resection of costal cartilages	No	Empyema. Cerebral embolism	Death
4	Bagroff*	1929	? Both ventricles and intraventricular septum	?	?	?	?	?	?
5	Martinez*	1927	?	?	?	?	?	?	?
6	Meier*	1930	Gunshot	?	?	?	?	?	?
7	Teplitz*	1926	?	?	?	?	?	?	?
8	Timoshenko*	1929	?	?	?	?	?	?	?
9	Toptichibosheff*	1930	?	?	?	?	?	?	?

*No data could be obtained on these cases.

Table 5

TABLE OF CASES OF WOUNDS OF THE HEART COLLECTED BY MUKHADZE DESCRIBED IN RUSSIA SINCE 1925

No.	Surgeon	Year of Operation	Type and Position of Wound	Duration Before Operation	Other Injuries	Sutures: Number and Kind	Complications	Result
1	Asriev, L. G.	1928	Stab. Left auricle	?	Pleura	3 silk	?	Recovery
2	Bugolubov, V. A.	?	Stab. Right auricle	50 min.	Pleura and diaphragm	3 silk	?	Death 24 hrs.
3	Bogolubov, V. A.	?	Stab. Left auricle and left coronary artery	?	?	2 silk	Bronchopneumonia and hemopneumothorax	Death 72 hrs.
4	Djanelidze, U. U.	1923	Stab. Right auricle	A few min.	?	4	?	Death 24 hrs.
5	Djanelidze, U. U.	1925	Stab. Right auricle	3 hours	Pleura	5 ant. and 3 post.	?	Death 24 hrs.
6	Djanelidze, U. U.	1926	Stab. Right auricle	?	—	3 catgut	None	Recovery
7	Elansky, N. N.	1926	Stab. Left auricle*	48 hours	—	2 catgut	Serous pleuritis	Recovery
8	Eristov, K. D.	1923	Bullet. Left auricle	3 hours	Lung and pleura	2	Suppurative pleuritis and pericarditis	Death 16 days
9	Eristov, K. D.	1927	Stab (cut)*. Left auricle and left coronary artery	40 min.	Lung and pleura	2	None	Recovery
10	Frolov, V. E.	1923	Stab. Right auricle	2 hours 15 min.	—	6	None	Recovery
11	Gipgolav, S. S.	1927	Bullet. Left ventricle	2 hours	—	4 ant. and 4 post.	None	Recovery
12	Hesse, E. P.	1921	Bullet. Left auricle	4 hours	Pleura and lung	3 silk	?	Death 36 hrs.
13	Ivankowitsch	1927	Bullet. Right auricle	1 hour 10 min.	Pleura and lung	3	Hemothorax	Death 25 days
14	Kachiani, N. C.	1923	Bullet. Left auricle	?	Pleura, lung and vessel in root of lung	?	?	Death
15	Kozyrev, V. V.	?	Bullet. Left auricle*	?	Pleura	3	Bilateral pneumothorax	Recovery
16	Kozyrev, V. V.	1926	Stab. Left ventricle	?	—	?	None	Recovery
17	Kortschitz, E.V.	1927	Stab. Right auricle	8 hours	—	?	None	Recovery
18	Kremschevsky, D.	?	Cut. ?	?	—	13	?	Death 28 hrs.
19	Lavstschkin, V.	1924	Stab. Right auricle	2 hours	Pleura and lung	5	Pneumothorax	Recovery
20	Mamikonov, M.N.	1928	Stab. Right pericardium	6½ hours	Pleura and lung	2	Pericarditis, pneumonia	Recovery
21	Mukhadze, G.M.	1928	Stab. Right auricle	35 min.	—	4	Pleuritis, subcutaneous emphysema	Recovery
22	Nemilov, A. A.	1924	Stab. Left auricle	35 min.	—	4	Subcutaneous emphysema	Recovery
23	Oschman, A. A.	1913	Stab. Left auricle	2 hours	Pleura and lung	4	Suppurative pleuritis, pericarditis	Death
24	Polikarpov, P.N.	1925	Stab. Left auricle	1 hour	Pleura	—	None	Recovery
25	Savistky, A. I.	1925	Stab. Left auricle	1 hour	Pleura	—	None	Recovery
26	Shapiro, P. M.	1927	Stab. Left ventricle	1 hour	Pleura	4	None	Recovery
27	Smirnov, E. A.	1926	Stab. Right auricle	2 hours	—	2	Bilateral pneumonia	Recovery
28	Smirnov, E. A.	1927	Stab. Left pericardium	2 hours	Pleura	3	Bronchopneumonia	Recovery
29	Tscherepnin, K.N.	1923	Stab. Left auricle	?	—	3	None	Recovery
30	Vinogradov, N.P.	1927	Stab. Right auricle	?	—	2 silk	Subcutaneous emphysema	Recovery
31	Zavjalov, N. A.	1925	Stab. Right auricle	1 hour	—	3	Suppurative pleuritis. Pericarditis	Death
32	Zhemtschuzhny	1925	Bullet. Left auricle	2 hours 40 min.	—	3	None	Recovery

*Non-penetrating.

literated by old fibrous adhesions, which caused a fixation of the mediastinum. There was a penetrating wound of the left lung and a tangential wound of the pericardium and of the heart near the apex, which had not entered the ventricular cavity. The wound in the pericardium had allowed blood to leak into the pleural cavity, preventing pericardial tamponade. There was a large collection of blood in the pleural cavity which, with the fixation of the mediastium, caused a marked increase in intrapleural pressure. This pressure had apparently interfered with the pulmonary circulation, causing pulmonary congestion and anoxemia.

Case 3.—W. R., a colored boy 23 years of age, was admitted to the Saint Philip Hospital on October 2, 1930, at 12:00 noon. He had been stabbed in the left side of the chest about thirty minutes before admission. He later stated that he walked one and a half blocks after being stabbed before he began to feel faint; and he estimated that ten or fifteen minutes elapsed between the time of injury and the appearance of marked weakness.

When admitted to the hospital the patient appeared to be in profound shock. His radial pulse was not palpable and his blood pressure could not be obtained. He was put to bed with the foot of the bed elevated and was given morphine (gr. ¼) and atropine (gr. 1/150). In a few minutes his pulse became palpable and his systolic blood pressure rose to 80 mm. Hg. Examination of the chest showed a stab wound about 2 cm. in length in the fourth interspace, 5 cm. to the left of the sternum. There seemed to be an enlargement of the area of cardiac dulness and the heart sounds were distant and muffled, which signs were thought to indicate a collection of blood in the pericardial cavity. There was no evidence of fluid in the left pleural cavity and only slight pneumothorax. Since there had been little external hemorrhage and since the patient's signs of shock were out of proportion to the blood loss, it was concluded that he had a large collection of blood in the pericardial cavity resulting in heart tamponade. He was transferred to the operating room forty minutes after admission and approximately one hour and ten minutes after the injury.

Procaine hydrochloride solution (0.5 per cent) was used as a local anesthetic. An incision was made 12 cm. in length, extending from the sternum out along the fourth rib. Another incision, 6 cm. in length, was extended downward from the center of this. The fourth and fifth cartilages and about 3 cm. of each rib as well as the periosteum and intercostal structures were resected and a small opening in the pleura beneath the fourth rib sutured. The internal mammary artery was doubly ligated and divided. The left pleura was dissected away from the pericardium, but this did not give an entirely adequate exposure, so the left half of the sternum between the third and sixth cartilage was excised, giving an excellent exposure of the pericardium, which was greatly distended with blood. It was incised and about 200 c. c. of blood evacuated. Bright red blood was spurting from a wound in the left ventricle with each systole. The left hand was passed behind the heart and gently compressed it until a suture could be inserted through the apex. A wound 1 cm. in length was found on the left border of the heart parallel to its long axis and about 5 cm. above the apex. The descending branch of the left circumflex coronary artery had been divided. The profuse hemorrhage indicated that the wound communicated with the

Table 6

TABLE OF UNCOLLECTED CASES PRIOR TO 1926

No.	Surgeon	Year Reported	Type and Position of Wound	Duration Before Operation	Anesthetic	Type of Thoracotomy	Drainage of Pericardium	Complications	Result
1	Blackburn, J.T.	1924	Stab. Right ventricle	?	Local	Resection of costal cartilages	No	None	Recovery 15 days
2	Burian, F.	1922	Stab. Left ventricle.* Branch of coronary artery	2 hrs.	?	Trapdoor	No	Postoperative anginal attacks of pain	Recovery
3	Engel	1923	Stab. Right ventricle	2 hrs.+	General	Trapdoor	No	?	Recovery 28 days
4	Hill, R. S.	1924	Bullet. Ventricle*	?	?	?	?	?	Death 24 hrs
5	Noland, Lloyd	1924	Stab. Right auricle	25 min.	General	?	?	Lobar pneumonia	Death 5 days
6	Puccinelli	1925	Stab. Right auricle	25-30 min.	Ether	Division of sternum and resection of costal cartilages	Yes	?	Recovery 30 days
7	Schonbauer	1924	Stab. Right ventricle	½ hr.	Ether	Trapdoor	No	Pulmonary embolism	Death 2d day
8	Simeoni	1925	Stab. Left auricle	9 hrs.	Ether	Resection of costal cartilages	Yes	?	Death 9 hrs
9	Simeoni	1925	Stab. Left ventricle	1 hr.	Ether	Resection of costal cartilages	No	?	Recovery 30 days

*Non-penetrating.

cavity of the left ventricle, but no attempt was made to determine this by instrumentation. Since the wound was almost parallel with the long axis of the heart, the apical suture served not only to steady it while three interrupted sutures were inserted, but also served to control the hemorrhage. It was then discovered that there was considerable bleeding around the traction suture, so it was removed and the bleeding controlled by two fine silk sutures. The patient's pulse was of poor volume at the beginning of the operation, but the anesthetist stated that there was a prompt and marked improvement immediately following the incision of the pericardium. The opening in the pericardium was closed with interrupted sutures except for an area about 1 cm. in length where a small drain was inserted. The muscles, fascia, and skin were approximated with interrupted sutures. Normal saline solution was given intravenously during the operation and the patient was in good condition when returned to the ward.

Two hours after operation his temperature was 97.4°, pulse 88, respiration 20. Eight hours after operation his systolic blood pressure was 96 and two hours later it was 112 mm. Hg. Twelve hours postoperative his temperature was 99.4°, but twelve hours later it dropped to 98° and his pulse rose to 120. The heart sounds were distant and the pulse was of poor quality, indicating a collection of fluid in the pericardial cavity. The drain was removed, following which a large quantity of clear fluid escaped and the patient's condition promptly improved. The afternoon of the second postoperative day his temperature rose to 102.2° and the following day to 103°. At this time he showed definite signs of consolidation in the lower lobe of the left lung. His temperature then gradually came down to 101° and remained at that level for several days. On the seventh postoperative day examination revealed a collection of fluid beneath the incision. Purulent fluid was aspirated, the incision opened, and about one ounce of pus evacuated. His temperature promptly came to normal and continued so until the time of his discharge from the hospital on October 18, sixteen days after the injury. He has been seen several times since discharge in the Out-Patient Clinic and seems little the worse for his experience.

Case 4.—W. J., a colored man 36 years of age, entered the Saint Philip Hospital about 11:00 p. m. on July 4, 1931, complaining of a stab wound of the left side of the chest. About 7:00 p. m. he had had an altercation with another negro, who stabbed him in the chest with a pocket knife. After being stabbed he ran about fifty yards and then fell to the ground, apparently unconscious. He was put in a car and carried five miles to the office of Dr. J. T. Booth, of Ashland, Virginia, who stated that when the patient entered his office he was bleeding freely from the stab wound in the chest and was in profound shock. He was given morphine (gr. ¼) and atropine (gr. 1/150) and placed on a table with his feet elevated. In about fifteen minutes his pulse became palpable and his skin warmer. A diagnosis of stab wound of the heart was made and as soon as his general condition permitted, he was sent into the hospital, a distance of about twenty miles.

On admission his systolic blood pressure was 120 mm. Hg.; his pulse was 90 per minute and of fair quality. Examination revealed a stab wound in the left fifth intercostal space about 5 cm. from the midsternal line, which was not bleeding. The area of superficial cardiac dulness was apparently not increased, but the heart sounds were distant and muffled. There were no physical signs of fluid or air in the left pleural cavity. A tentative diagnosis of stab wound of the heart was made and the patient transferred to the operating room approximately six hours after the injury.

Procaine hydrochloride (0.5 per cent) solution was used as a local anesthetic. A curved incision was started at the lower border of the fourth costal cartilage and extended downward and then outward along the sixth costal cartilage to the nipple line. The fifth costal cartilage and one inch of the fifth rib was excised and the fourth and sixth cartilages were divided near the sternum, separated from the underlying structures, and retracted. The left half of the sternum between the fourth and sixth costal cartilages was removed by rongeur forceps. The deep epigastric artery had been severed, so the ends were ligated. The left pleura was separated from the pericardium, at which time there was a profuse flow of blood from a stab wound in the anterior portion of the pericardial sac. This was opened and a moderate amount of blood found. There was a constant flow of dark blood from a stab wound in the mid portion of the anterior wall of the right ventricle. The wound was 1.5 cm. in length, was situated about 5 cm. above the apex level and directed transversely. A traction suture was inserted through the apex, and with this to steady the heart the wound was closed with three interrupted sutures of fine silk. The blood was then aspirated from the pericardium and its edges loosely approximated.

The patient was in excellent condition when returned to the ward and remained so until the morning of the third day, when his systolic blood pressure dropped to 70 mm. Hg. Examination of the left side of the chest revealed a distinct bulging beneath the wound. Two hundred and fifty c. c. of straw-colored fluid was aspirated, following which there was a rapid improvement in his general condition. He developed a mild infection in the wound and an effusion in the left pleural cavity. The latter was aspirated on July 16 and 1,200 c. c. of blood-tinged fluid was removed and again on August 14, when 1,400 c. c. of light straw-colored fluid was obtained. When discharged from the hospital on September 1, 1931, he was symptom-free and has remained so.

DISCUSSION OF CASES

Case 1 was diagnosed as one of pericardial injury by the presence of a splashing sound synchronous with the heart beat; and the diagnosis was confirmed by the demonstration of pneumopericardium on x-ray examination and by the subsequent development of a pericardial friction rub. Surgical treatment was not indicated.

Case 2 was not recognized as one of cardiac injury, but it is doubtful if the heart wound had much effect on the outcome, as there was no increase in intrapericardial pressure and probably only moderate hemorrhage from the heart. Because of the fixation of the mediastinum, the thoracic signs were not entirely characteristic of massive hemorrhage. However, if the condition had been recognized, the left side of the chest

would have been explored and the outcome might have been different.

Case 3 represents the type in which there is marked increase in intrapericardial pressure with resulting circulatory collapse. Since there was such marked improvement following incision of the pericardium, it was evident that the loss of blood was not responsible for the patient's circulatory collapse, but that this was due to the cardiac tamponade. The prognosis in this type of case is serious unless operation is performed, but recovery is apt to follow relief of the cardiac tamponade and suture of the wound.

Case 4 represents the same type, but one in which surgical relief is somewhat less urgent.

SUMMARY

The mortality rate for wounds of the heart has been greatly reduced by operation and may be further reduced by earlier diagnosis and improvement in technic. To accomplish this it is necessary that surgeons familiarize themselves with the indications for operation and the technic employed.

Wounds of the pericardium alone should not be treated surgically unless there is evidence of intrapericardial hemorrhage or infection. The development of cardiac tamponade produces characteristic symptoms and signs which demand immediate relief. When blood does not become trapped in the pericardial sac, the difficulty of diagnosis is greatly increased; but if there is evidence of continued intrathoracic hemorrhage, an exploratory thoracotomy should be done.

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DISCUSSION (*Abstract*)

Dr. James Q. Graves, Monroe, La.—In wounds of the chest to the left of the sternum where it is possible that the heart or pericardium could have been injured, the symptoms should be very closely observed. The symptoms of a hemorrhage of any note are rather outstanding and easily recognized. We invariably find precordial distress, cyanosis, dyspnea, shallow respiration, cold and clammy skin. If there is much hemorrhage the rapid pulse rate may be regular and thready with a marked fall in blood pressure. In some cases the heart under compression produces heart tamponade, giving a slow weak pulse. The heart sounds are faint and distant and death follows. The x-ray is of much importance in arriving at a diagnosis.

If the bleeding is confined to the pericardium it is usually limited to 250 grams; however, a hemorrhage into the pleural cavity as well as the pericardium often occurs, depending upon the kind and extent of the injury. Cases have been reported where injuries to the heart produced laceration of the muscles without any apparent injury to the pericardium; for example, in sudden blows over the heart by falls or any heavy blow over the left chest. Cases displaying such symptoms as these following an injury in the region of the heart should be studied very carefully and accurately, and if it is determined that surgical interference should be instituted, delay is not advised. In the borderline group as described in Dr. Bigger's paper, it is in keeping with good surgical judgment to institute the proper medicinal treatment and keep the patient under observation.

Smith has pointed out that patients with heart wounds have three chances in four of surviving long enough to permit surgery, one chance in ten of healing spontaneously, and a little better than one chance in two of being cured by surgical treatment.

Lund has shown that approximately 80 per cent of patients with heart wounds should be operated upon and half of them should recover.

Gunshot wounds of the heart are more dangerous than other injuries, as is shown by statistics compiled during the Great War. One-third of gunshot wounds of the heart, where statistics were properly compiled,

showed that death was immediate or within the first hour. The majority of stab wounds are amenable to surgical treatment if they are promptly dealt with.

About thirty-four years ago the heart muscle was first successfully sutured, since which time this operation has been performed rather frequently. Those who have had the opportunity to operate upon the heart and pericardium have contributed much valuable information by their study and experience. It required a great deal of courage as well as ability on the part of the surgeon to do pioneer work successfully on this, the most important organ of the body.

Proper exposure of the pericardium and heart is necessary. It is important to have room to handle the organ to the best advantage.

Surgical speed is necessary in many instances, but should always be controlled by surgical judgment and the very best of surgical asepsis and technic. Dr. Bigger called attention to the fact that the instruments producing the injuries are always surgically unclean.

Our experience, like that of other surgeons, furnishes evidence that surgery of the heart and pericardium following accidents is safe. While the mortality in such injuries is high, under favorable conditions it can be lowered and many lives saved which were heretofore lost.

Dr. Wm. B. Porter, Richmond, Va.—Obviously the prompt diagnosis of wounds of the heart muscle is of major importance. Much might be said about the signs and symptoms indicating this accident, but they resolve themselves into the consideration of the wound and its location, and those phenomena and symptoms indicating the rapid accumulation of fluid in the pericardial sac. The latter symptoms undoubtedly occur unless the wound is sufficiently patent to allow the blood to escape externally. It is to be remembered, however, that the percussion phenomena of the pericardial effusion may be quite indefinite due to the fact that the pericardial sac will not distend very greatly when the fluid accumulates rapidly. For this reason the symptoms referable to tamponade of the auricles are of major importance. These consist of a rapidly falling blood pressure with a rise in pulse rate, but particularly the presence of marked distention of the veins in the neck. This latter phenomenon is of particular interest, for without it the symptoms may be confused with those of traumatic shock.

We have been interested in the changes noted in the electrocardiogram. In each case changes have been observed and were characteristic of those noted in coronary occlusion. It is to be remembered, however, that they do not occur immediately and they should not be waited for in such a serious emergency. It is doubtful whether the alterations appear in less than five or six hours after the reception of the wound. When they do appear they are of major importance, for the reason that wounds of the heart occur as a rule during that combative era of man, namely, from 25 to 35 years of age.

Coronary artery disease which produces similar changes are noted infrequently at this period of life. Hence it would be reasonable to attribute the electrocardiographic findings to traumatic injury.

Dr. Daniel C. Elkin, Atlanta, Ga.—In a recent case of stab wound of the heart, I was able to show electrocardiographic evidence of damage of the anterior descending branch of the left coronary artery in man under experimental conditions. The patient, who had a wound of the right ventricle, also had a completely severed coronary artery. Electrocardiograms were made before and at frequent intervals after the suture of the wound and ligature of the artery. It was interesting to note that electrocardiographic evidence of coronary occlusion did not appear until thirty-six hours after the accident. This fact proves that electrocardiograms may be of no value in differentiating the pain of coronary occlusion from the pain of acute abdominal conditions.

Dr. Bigger (closing).—I do not believe one is justified in getting x-rays or electrocardiograms in the average case of heart wound because of the time consumed in carrying out these procedures. Furthermore, x ray plates may be misleading, as the pericardial shadow is only slightly increased in size, due to the fact that rapid filling produces only slight distention.

CEREBRAL VASCULAR LESIONS DISCLOSED AT OPERATION*

By E. F. Fincher, Jr., M.D.,
and
Chas. E. Dowman, M.D.,†
Atlanta, Ga.

The clinical differentiation between slowly progressive vascular lesions and tumors of the cerebrum is sometimes a very difficult problem, the solution of which in a few instances is only possible after an exploratory craniotomy. Out of a series of over 1,000 craniotomies there have occurred five cases in which the lesions disclosed at operation were definitely of vascular origin. The findings at operation and the subsequent clinical course of these patients have been consistent with this diagnosis. The number of these cases prohibits drawing any definite conclusions, but there are certain facts concerning the group and some individual features of each case that are worthy of consideration.

Case 1.—D. C. H., a male, age thirty-seven years, was referred by Dr. J. E. Paullin, of Atlanta, on March 17, 1925.

The onset of this illness began about March 1, 1925, with attacks of twitching of the right eyelid lasting about four or five seconds, occurring twelve to fifteen times a day. Associated with the twitching attacks was a rather marked dizziness, which persisted a trifle longer than the motor phenomena. Five days after onset there occurred a numbness in the left hand, which slowly spread up the arm and within a week after its onset had involved the entire left arm, the left side of the neck, and the left side of the face. With the onset of this sensory disturbance the twitchings of the eyelid disappeared, as did the dizziness. Associated

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†Deceased.

with the numbness in the left arm there was some progressive motor weakness in this same extremity. Ten days after the onset of the illness there began rather generalized headaches which persisted.

Positive Neurological Findings.—The right pupil was larger than the left; sensation to light touch was slightly obtunded over the left side of the face; the tongue deviated slightly to the left; there was a tendency to downward wandering of the left hand when both arms were outstretched, with slight motor weakness of the left hand and arm; sensation to light touch was obtunded over the left hand; and there was a distinct loss of joint sense in the fingers of the left hand, and a loss of sense of position of the left upper extremity, with complete astereognosis; there was an inability to differentiate between coarse and fine cloth texture, and some slight lagging of the left hand as compared to the right on rapid alternate supination and pronation; the left abdominal reflex was sluggish; and all the deep tendon reflexes were hyperactive on the left side.

Preoperative diagnosis was a lesion of the right parietal lobe with slight involvement of the right precentral area, most probably a tumor. A thrombosis of the right rolandic vein would give a similar picture. Exploration was advised.

Operative Findings.—March 20, 1925, there was no evidence of increased intracranial pressure. The convolutions were rather firm but not flattened or broadened. There was an abundance of subarachnoid fluid. The rolandic vein was blackish-blue in color, very hard to palpation, and could not be obliterated by pressure. The walls of the vein were thickened and opaque in color. The contributory cortical veins were distended but were soft and could easily be compressed.

The postoperative diagnosis was thrombosis of the right rolandic vein, cause undetermined.

The postoperative convalescence was uninterrupted and the patient was dismissed from the hospital at the end of two weeks. At the time of dismissal all subjective symptoms and objective findings had completely disappeared. In April, 1928, the patient experienced a momentary feeling of numbness in the left foot. Examination at this time showed no abnormal neurological findings. He had no further trouble until May 1930, when he had an attack of numbness in the right arm and leg which lasted for a few minutes. He has been quite active since operation.

The probability that the symptoms in this case were due to a thrombosis of the rolandic vein was an extremely meager one. This case was reported by one of us[1] in 1926. The rarity of this condition can be fully appreciated with the knowledge that only one other case appears in the literature. This was Waggoner's[2] case in which a thrombosis of the superior cerebral vein was found at autopsy. In his case, a man seventy-eight years of age, the thrombosed vein overlay a plexiform angioma of the cerebrum.

Exploration was advised in *Case 1* because of the possibility of an early infiltrating cortical tumor, or a small fibroblastic meningeal growth which either by direct cortical pressure or venous blockage of the rolandic vessel would have given rise to the same symptoms and findings as this case presented.

Such a case was operated upon by one of us (C. E. D.) several years ago, and a meningioma some 2 cm. in diameter, weighing 18 grams, was removed. The patient was a man fifty-seven years of age, who four months before operation began to have a loss of motor function which began in the right side of his face and rapidly progressed to result in a comp'ete right hemiparesis. There was a loss of joint sense in the fingers and toes of the right side, with a loss of sense of position of the right extremity. There was also a right sided hypoesthesia to light touch. There was no evidence of generalized increased intracranial pressure in that case.

One might speculate upon the possibility that the operative manipulation was a factor in the complete disappearance of the patient's symptoms in *Case 1,* but the real value of the exploration lay in the exclusion of a cerebral neoplasm.

Case 2.—P. L. H., a male, age fifty-one years, was referred by Dr. E. Bates Block of Atlanta, on October 11, 1926.

The onset of this illness began about August 1, 1926, with headaches and a transient sensation as if he were going to faint. The following night he began to have difficulty in talking, in that he knew what he wanted to say but had to be prompted before he could find the proper word. A few days later he noticed a beginning weakness in the right hand which gradually progressed to involve the entire right side. At times, in his writing it was noticed that some of the letters were written upside down. Since the onset, headache was fairly constant in the left frontal region.

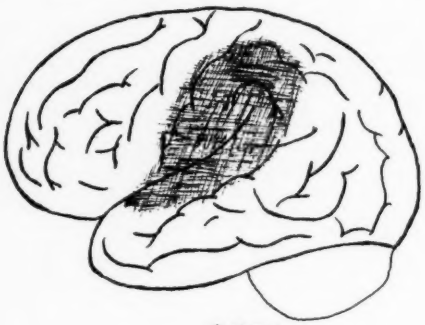
Positive Neurological Findings.—His cerebration was sluggish; there was a complete right homonymous hemianopsia, slightly diminished sensation to light touch over the right side of the face, a paraphasia of motor type, a hemiparesis of the right side including the face, diminished sensation to touch over the right arm, a complete loss of joint sense in the fingers and toes of the right side, loss of sense of position of the right extremity, complete astereognosis right, definite object blindness, absent abdominal reflexes on the right, exaggerated knee jerks right and left, more so right than left, and a bilateral Babinski reflex. His blood pressure was 172-110.

Preoperative diagnosis was a lesion of the left parieto-temporal region. The gradual development of symptoms in spite of the somewhat sudden beginning, suggested a brain tumor. Exploration was advised.

Operative Findings.—November 13, 1926, there was no evidence of increased intracranial pressure, the subarachnoid fluid was normal in amount. Posterior to the rolandic fissure in the lower part of the postcentral region the convolutions were yellowish-white in color and very soft. This discoloration merged with the upper portion of the postcentral region, the color of which was grayish-white. In these regions there seemed to be no circulation in the fine capillaries of the pia-arachnoid. The gross appearance was that of a large infarct of the parietal lobe. Upon incising the cortex an abundance of degenerative brain tissue was removed. In the anterior portion of the cavity from which the softened material was removed a large bluish black thrombosed vessel was seen and palpated.

Postoperative diagnosis was cerebral infarct, and thrombosis of the ascending parietal branch of the mid-cerebral artery.

The postoperative convalescence was uninterrupted. By the end of the first week the muscle strength in the right leg had shown considerable improvement. Eight months later the patient was up and about and had regained the use of his right arm and the speech difficulty had disappeared.



CASE II.

The rather abrupt onset, the elevated blood pressure, and the absence of increased intracranial pressure findings lent weight to the possibility that the lesion was of vascular origin. However, the progress of the symptoms pointed to a progressive lesion and in the absence of supportive evidence of vascular disease exploration was advised. The advisability of operation in such a case is illustrated by a recent experience, in which the clinical evidence was strongly in favor of a vascular lesion.

This patient was fifty-seven years of age, had been a habitual user of alcohol for years, had a retinal arteriosclerosis, a diminished renal function, and a systolic blood pressure of 192 mm. of mercury. The onset of his illness was sudden, with a paralysis of the right arm and when seen two weeks later there had been no further progress of symptoms. A jacksonian attack of the affected arm during the neurological examination prompted an exploratory craniotomy. A cortical glioma was gross'y removed (E. F. F., Jr.) from the left motor arm area. Microscopic examination of the tissue removed in this case showed it to be a spongioblastoma. This case is a beautiful illustration of a cerebral tumor with all the evidence pointing toward a vascular lesion, and all of the symptoms might have been easily explained on that basis.

Case 3.—C. E. F., a male, age fifty-seven years, was referred by Dr. Wm. A. Smith of Atlanta, on August 29, 1930.

The onset of his illness began in August, 1929, with a slight weakness in the right foot. There had been a gradual loss of motor function in the right leg since onset. In November 1929, there had been a weakness in the right arm which s'owly progressed. From the onset of the illness the patient experienced some pain in the large joints of the extremities, more particularly in the joints of the right extremity. In January, 1930, the patient began to have an occasional frontal headache and during the first month of the headache there was an associated vomiting. At times he had some "ringing" in both ears. There was a history of generalized convulsions over a period of twenty years. All of the convulsions had occurred at night, averaging one a month for the first four years, after which there were six during the remaining sixteen years, coming on at rather prolonged intervals.

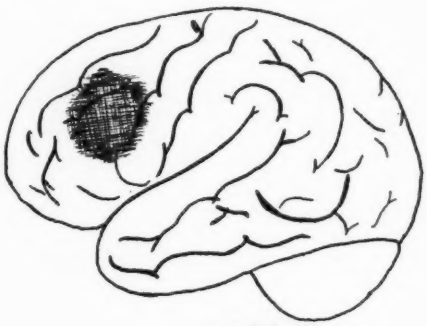
Positive Neurological Findings.—The right pupil was larger than the left; there was a slight weakness of the right sixth cranial nerve; a partial deafness in the left ear, a flaccid paresis of the entire right side of the body including the face; the abdominal reflexes were sluggish but equal; the right knee jerk was hyperactive, and Babinski, Gordon, Oppenheim and Schaeffer were positive on the right side.

The postoperative diagnosis was lesion of the left precentral area, probably a tumor. The possibility of a vascular lesion was kept in mind. Exploration was advised.

At operation, September 8, 1930, there was no evidence of increased intracranial pressure, and the subarachnoid fluid seemed to be normal in amount. Just anterior to the midportion of the precentral convolution there was an area some 4 cm. in diameter which was of a pale yellowish-gray color, and very soft. There was no cystic formation. The tissue was that of degenerated cortex.

The postoperative diagnosis was cerebral degeneration of vascular origin.

Immediately following operation there was a complete paralysis of the right side with a complete aphasia. These symptoms had practically subsided upon dismissal from the hospital on October 11, 1930. By February, 1931, the patient was able to resume his activities and is continuing his work with no further trouble.



CASE III.

Laboratory examinations, such as microscopic and chemical blood studies, urine analyses, renal function tests, spinal fluid studies and routine x-ray plates of the skulls were of negative value in this case as they were in the other four. The only physical finding in any of the cases was a systolic blood pressure of 172 mm. of mercury

in *Case 2*. The possibility of ventricular or spinal air studies was considered in one or two instances, but with such localized findings as each case presented it was hardly felt that either of these procedures was indicated. Spinal air studies, where the subarachnoid spaces could be visualized, would doubtless be of more diagnostic value than ventricular air injections, for in a post mortem specimen of one of the cases studied by Riley and Elsberg[3] particular attention was called to the normal size and relation of the ventricles. This was a case of cerebral degeneration. Had a ventricular study in their case been done the exclusion of a cerebral tumor could not have been definitely established. In support of this contention one of us (C. E. D.) in 1929, after normal ventricular air studies, was prompted by a jacksonian attack to perform an exploratory craniotomy. In this case a cortical glioma was removed from the posterior part of the second frontal convolution. This patient is still alive, is active and free from any symptoms.

The absence of choked discs in the five cases in this study could not be relied upon as evidence of a vascular lesion rather than a tumor. In our series of 214 verified tumors of the brain, 32 have shown no changes in the appearance of the optic nerve heads on ophthalmoscopic examination. This point cannot be too strongly emphasized in studying cases where there is a possibility of a cerebral neoplasm. There still exists in the minds of many the triad of pressure symptoms, namely, headaches, vomiting, and choked discs, as prerequisites to the diagnosis of brain tumor. True enough had one waited for this triad to develop in these five "vascular cases," exploration would never have been done. On the other hand, had exploration been deferred in the 32 cases of verified tumor showing no evidence of increased intracranial pressure, some of the most gratifying results would not have been possible. It is quite true that in all 5 of these cases where the cerebrum was exposed, anticipating a neoplasm, one's diagnostic vanity was somewhat jolted. But as Cushing once wrote, it is a question:

"Which is the greater source of humiliation, to operate unnecessarily upon a patient for a pseudo tumor syndrome and to find merely an edematous and arteriosclerotic brain or to refer a case to a psychiatrist and learn a year or so afterwards that a frontal meningioma has been found at autopsy."

Case 4.—W. M. F., a man, age fifty years, was referred by Dr. E. R. Aycock of Monroe, Georgia, on December 26, 1930.

The onset of his illness began in April, 1930, with attacks of numbness beginning in the left hand and spreading up the arm. There was an associated olfactory aura. The sensory attacks lasted about ten minutes but the aura occurred several times daily for eight to ten days. In May, 1930, the patient began to have lighter sensory attacks always associated with the hallucinations of smell. These attacks lasted from two to three minutes, and increased in frequency until November, 1930. At this time he began taking luminal. There were no associated motor phenomena other than a tendency to stagger during one of the sensory attacks. The staggering disappeared with the cessation of the sensory attacks. Generalized headaches occurred on one or two occasions during the course of the illness, but were not persistent.

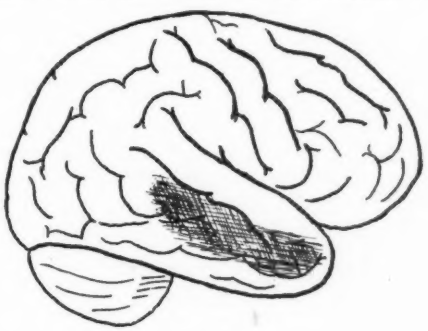
Positive Neurological Findings.—The optic nerve heads were somewhat indistinct in outline, but there was no frank edema. His cerebration was somewhat sluggish, there was a distinct weakness of the left side of the face, the muscle strength in the left hand was less than it was in the right, the superficial abdominal reflexes were absent on the left, the cremasteric reflex was absent on the left, and the left knee-jerk was hyperactive.

Preoperative diagnosis was lesion of the left temporofrontal region, probably an infiltrating tumor, but possibly a vascular degeneration. Exploration was advised.

Operative Findings.—On opening the dura January 2, 1931, the cortex bulged, evidencing increased intracranial pressure. The sylvian veins were quite engorged. Exploration of the frontal and middle cranial fossae revealed no evidence of tumor. The midfrontal convolution was pale yellow in color and on palpation was softer than the surrounding cortex. A canula introduced into this area encountered no cyst. Fragments of tissue removed showed only degenerated brain. On account of the apparent pressure the entire boneflap was sacrificed to permit maximal decompression.

Postoperative diagnosis was subcortical neoplasm with cortical degeneration.

The postoperative hospitalization was uninterrupted and the patient was discharged at the end of three weeks. At this time his neurological symptoms were



CASE IV.

unchanged. For several weeks after the patient's return home he was up and active. At the end of this time there began arthritic complaints, digestive disturbances, loss of weight, and when he was examined on February 27, 1931, instead of a tense bulging scalp flap there was a tremendous depression as large as the bone defect

would permit. There was free pulsation of the underlying brain. The motor symptoms had disappeared. On the last report, September 15, 1931, the patient had developed marked melancholia, was bed-ridden, and was leading a very vegetative existence.

In this case with the subsequent development of symptoms, the marked cranial depression, together with the microscopic study of the tissue removed at operation warranted changing the immediate postoperative diagnosis. The pathological changes which occur in cerebral degeneration subsequent to vascular changes have been detailed by Riley and Elsberg[3] in a study of "cerebral degeneration, infiltrating cerebral neoplasm, and the degenerative changes not infrequently associated with neoplasmas." In all of the cases except the one of the thrombosed rolandic vein, the tissue removed either by cortical excision or subcortical suction have on microscopic study shown no suggestion of neoplastic disease. The subsequent course in each of the cases has been that of vascular degeneration rather than that of a tumor. This should be stressed, because frequently associated with a subcortical neoplasm there are overlying or adjacent areas of cortical degeneration. This frequent association of degeneration in connection with infiltrating tumors is so common that the warning of Riley and Elsberg[3] may be repeated, namely:

"From the evidence obtained at the operating table the diagnosis of primary cortical degeneration should be accepted with great reservation, for a tumor is often the cause of vascular changes."

In *Case 4* the tendency toward a remission of symptoms was more in favor of a degenerative condition. The olfactory aura associated with the sensory attacks is a common symptom in neoplastic lesions involving the temporal lobe, but is rarely encountered in vascular conditions. The tendency to remission of symptoms is rather constant where the lesion is of vascular origin. However, it sometimes occurs in tumors of the brain of which the following case is an illustration:

A male patient, age forty-six years, consulted Dr. Wm. A. Smith in December, 1930. A sudden weakness in the right foot was noticed two weeks after a sudden weakness in the right side of his face and right arm. This weakness in the foot lasted for about six days and entirely disappeared. The weakness in the arm also varied from time to time. Three months after fluctuating symptoms there developed a constant headache and choked discs. With the development of increased intracranial pressure symptoms an exploratory craniotomy was done and a subcortical infiltrating glioma was encountered. Seven months after operation post mortem studies showed this tumor to be a spongioblastoma.

It is of interest to speculate just why in this instance prior to the development of increased pressure symptoms there was a fluctuation of symptoms. It seems justifiable to conclude that interference with blood supply by the growing lesion could easily account for such a phenomenon.

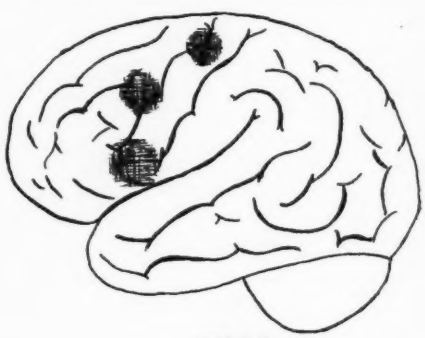
Case 5.—T. M. R., a man of forty years, was referred by Dr. C. W. Strickler, of Atlanta, on June 18, 1931.

The onset of his illness began in October, 1930, with a weakness of the right hand, which slowly progressed. In December, 1930, there occurred a jacksonian attack involving the right hand and arm and lasting for a few seconds. There occurred a second similar attack four months later. In March, 1931, he began to have some difficulty in his speech, which was described as "a groping for the proper words at the proper time." At this time he began to have left-sided headaches, which were constant. In June, 1931, there developed diminution in visual acuity. About this time there developed a weakness of the right side of the face and shortly afterwards of the right foot, which was progressive.

Positive Neurological Findings.—There was diminution of hearing on the left, speech slow and hesitant, emotional movements poorly performed on the right side of the face, abdominal reflexes sluggish on the left, deep reflexes hyperactive of both upper and lower extremities, and a positive Babinski and Oppenheim reflex on the right.

The preoperative diagnosis was lesion of the left precentral region, probably a tumor. Exploration was advised.

Operative Findings.—June 24, 1931, there was no evidence of increased intracranial pressure. The amount of subarachnoid fluid seemed to be normal. In the posterior tip of the second frontal convolution there was a somewhat circumscribed area about 2 cm. in diameter, a second similar area in the upper portion of the precentral convolution, and a third area in the lower portion of the precentral convolution. These



CASE V.

three areas were all pale yellow in color, fairly definitely circumscribed, and were softer than the surround-

ing tissue. These isolated areas were incised and the degenerative tissue removed by suction, no one of which was grossly over 2 cm. in depth.

Postoperative diagnosis was cerebral degeneration of vascular origin.

Immediately following operation there was a complete hemiplegia of the right side and a complete aphasia. The patient was discharged from the hospital on June 10, 1931, walking with a slight limp of the right leg. When seen last, on October 12, 1931, his speech had improved and he was able to carry on a conversation; there was still a slight limp with the right leg, but there had been improvement in the use of the right arm.

CONCLUSION

There occurs among a large series of craniotomies an occasional lesion of vascular origin. The symptoms and neurological findings in these cases are those of brain tumors and exploration is justified. The subsequent course of the disease seems unaltered and the dangers of exploratory craniotomy are negligible.

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DISCUSSION (*Abstract*)

Dr. Ernest Sachs, St. Louis, Mo.—There is another difficult group of cases which belongs with this group: cases with vascular lesions with perfectly typical and very marked eyeground changes, cases which would fall, I suppose, into the group of so-called malignant hypertension. In these cases it has been absolutely impossible to tell whether the eyeground changes were a true choked disc from pressure or due to a vascular lesion.

I agree with Dr. Fincher that it is not only justifiable but essential that these cases be explored, and exploration in that type of case has practically no mortality. Whereas I am much opposed in general to operating upon any case without a positive diagnosis beforehand if it is possible, undoubtedly it is impossible to arrive at a definite diagnosis in cases such as he has described.

One point of interest among the many that he brought out is the fact, with which I thoroughly agree, that air injection, either an encephalogram or a ventriculogram, is of no value. In the presence of a focal convulsion, regardless of what air injection showed, an exploration should be undertaken. For the present, I think we shall continue to open a certain number of cases to determine whether or not they have a tumor.

Dr. Ralph Greene, Jacksonville, Fla.—A patient of this type should have the hope that he has a tumor and that he has chances for a cure. If it can be demonstrated that he has not a curable condition, it is easy to handle the case as one of chronic invalidism in its most hopeful aspect. In many instances these patients have been thrown about from pillar to post, to physicians and quacks, without being benefited.

I have a great admiration for the procedure of air injection of ventricular spaces. I do not think it is a harmful procedure. In reviewing a large number of air injections, one will look back upon an occasional case in which the air did not seem initially to be justified, but yet air indicated the finding we least expected. In one of my cases a man had an intraventricular tumor, and by the simple procedure of air injection a complete surgical cure was effected.

Dr. Pat Murphey, Little Rock, Ark.—As soon as the neurologist learns to handle the tools that the surgeon uses he will be able to make more correct diagnoses and when a craniotomy is done and no tumor is found he will help to share the responsibility along with the surgeon.

Dr. Temple Fay, Philadelphia, Pa.—Dr. Fincher has presented the subject that we have been working upon for the past year. Dr. Davis, in my department, is just completing a report on cerebral venous thrombosis, but as Dr. Dowman and Dr. Fincher have thoroughly covered the subject, our own report will probably only supplement this one by confirming the findings already presented. Dr. Fincher need not apologize for having found vascular lesions where tumors were suspected. I was pleased to note that the vascular cases operated upon improved and this has been my own personal experience. In fact, the neurologist has requested on two occasions that an exploration be made for a recognized cerebral thrombotic lesion with the request that the degenerated portion of the brain be removed, and this was done by the aid of suction. The cases have made a brilliant and rapid recovery and indicate that neurosurgery will have a wider field of application now that it is possible to undertake intracranial explorations with a very slight amount of risk.

It has been our experience at Temple University to find the neurologist willing to share in the responsibilities and problems faced by the neurosurgeon and in turn share in the plans for attacking the organic problems in neurology. It is only by mutual cooperation and effort that the neurologist will be aroused to the possible benefits to be derived from neurosurgery.

Dr. Fincher (closing).—Riley and Elsberg warn us in these vascular lesions that a too hasty diagnosis of degenerated brain should be guarded against. Occasionally where there has been a primary diagnosis of vascular degeneration subsequent autopsy studies reveal an underlying brain tumor, such a lesion being the most common cause for cortical degeneration.

TREATMENT OF HEAD INJURIES*

By JULIAN L. RAWLS, M.D., F.A.C.S.,
Norfolk, Va.

It is stated that approximately 25,000 people die each year from accidental head injuries. This means that nearly 100,000 receive injuries from which they recover as far as the immediate effects are concerned, but we know that nearly one-half of these, or in round numbers 50,000, are left with some mental instability; that a conservative estimate would place at least 10 per cent, or 10,000, as totally incapacitated. I believe that in medical centers, in hospitals with a well established neurological service under the supervision of a well trained neurological surgeon, these cases are well cared for today. But it is a fact that at the present time 50 per cent of these cases are due to automobile accidents and the tourist does not always pick out a well established medical center in which to have his accident; that many occur on rural highways and the victim of a head injury is taken to the nearest wayside hospital for subsequent treatment. So I believe that the more often we discuss this increasingly important subject the better our end-results will be.

I feel sure that all of us here have lived through the various stages of the treatment of head injuries since 1900. I recall in my student days that a patient was admitted on the service of one of the best known surgical teachers in the South with a fracture of the base of the skull and a broken arm. The teacher stated that it was not necessary even to attempt to reduce the broken arm, since all fractures of the base died. I also remember, as an intern, with what dispatch we rushed our fractured skull cases from the ambulance to the x-ray and to the operating room. There was no emergency more urgent than the fractures of the vault. And then came the time when we watched with keen interest for the evidences of increasing intracranial pressure, for the rising pulse rate and falling blood pressure as an evidence of a break in cerebral compensation in order that we might hurry our patients to the operating room for subtemporal or occipital decompression to forestall the inevitable brain disintegration. But an operative procedure that carried with it an extremely high mortality naturally caused us to stop and think, and then we began to realize that the large number of our patients died on account of our treatment, not in spite of it. The experimental work of Weed and Bagerly, of Swift, Fay, Ochsner and innumerable others, neurologists and physiologists, has shown us the physiology of the brain and the cerebral spaces and taught us a clearer concept of the pathological changes that occur when we have increased intracranial pressure and has given us the rational of a clearcut treatment based on this same physiology until now we feel that 70 per cent of our head injuries should recover if treated expectantly; that probably 20 per cent will die and that 10 per cent will require operative interference.

We are beginning to realize that fracture of the skull, whether of the vault or base, is of little significance as compared with the injury to the brain itself, either from the trauma or from the increased intracranial pressure, from hemorrhage or from edema. We are also realizing that there is probably one urgent emergency in head injuries and that is the rupture of the middle meningeal artery with increasing extradural hemorrhage. Dandy has pointed out that as this hemorrhage progresses the meninges are stripped from the bone and the torn veins add to the accumulated blood; that a spinal puncture does not relieve this situation and only results in more space for further hemorrhage; that ligation of the artery with evacuation of the clot is the only thing that gives relief. He gives the following symptoms as indicating this condition: a free interval of consciousness before a slowly deepening coma, a gradual hemiplegia affecting the face, arm and leg in the order named, convulsions beginning always in the face and spreading to the arm and leg. In an emergency of this kind valuable time can be lost with spinal puncture and intravenous medication.

Localized subdural or cortical hemorrhage with focal symptoms also require prompt operative interference. We feel, too, that compound fractures, depressed or with maceration of the brain, require operation as soon as the patient has reacted from the shock; that the disintegrated brain tissue should be gently washed out with warm normal saline and the bleeding points ligated or controlled with bits of muscle or fascia applied after the postage stamp method.

But we are beginning to question the dictum that simple depressed fractures always require operation. Naffziger and Glazer have shown

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experimentally that animals on whom it was possible to produce a depressed fracture without injury to the brain or in whom they lifted up the skull and introduced some foreign body between the dura and the bone without injury to the cortex beneath it developed none of the symptoms usually attributed to chronic brain irritation, convulsive seizures, spasticity, and so forth. So it would seem that depressed fractures without evidence of cerebral irritation may be left alone with safety with little likelihood of epilepsy developing. We, then, have come to the conclusion that rupture of the middle meningeal artery; that definite localized subdural hemorrhage; that compound fractures with depression or with destruction of brain tissue and simple depressed fractures with evidence of cerebral irritation alone require operation (of course I am not referring to those cases which come in late with evidence of chronic intracranial hemorrhage); that other injuries of the head are best treated expectantly, but this does not mean in any sense that they are to be left alone and their recovery trusted to nature. I am willing, however, to admit that nature would have had a higher percentage of recoveries than the old-time plan of operative procedure. The credit of the present method of treatment, I think, is largely due to the teaching of such men as Fay, Swift, Ochsner, Bagerly and others who have written on the subject. And it is to these men that I have turned largely for the subject matter of this paper. My own personal experience has been too limited for me to draw justifiable conclusions.

At present, briefly to outline our method of treatment: when a patient is admitted to the hospital with a head injury, whether unconscious or not, he is put immediately to bed and watched closely for shock and an attempt is made to anticipate shock if it is not already present. He is kept warm, his pulse and respiration are recorded every fifteen minutes, and his temperature, preferably rectal, and blood pressure reading are taken every one or two hours. I doubt that the blood pressure is of sufficient importance to disturb the patient every thirty minutes in order to make a record of it. While in no way belittling the value of frequent blood pressure readings, if we put too much reliance upon normal blood pressure we shall often be led astray. I have seen large intracranial hematomas develop with very little variation from the patient's normal blood pressure reading. No effort is made to obtain an x-ray and no extensive neurological examination is made at this time. The pupillary reaction is usually recorded since it is of prognostic value. Widely dilated, fixed pupils almost invariably foretell an early exit. Pupils normal on admission which later develop inequalities, irregularities and variations to light help us to determine the site of an intracranial hemorrhage. If the patient is already in coma and shock the intravenous injection of 50 c. c. of 50 per cent glucose followed a little later by 100 c. c. of normal saline may tide this patient over until he can receive more active treatment. If he is sweating profusely atropin or pituitrin may be given hypodermically with some relief. Cardiac stimulants and morphine are absolutely contraindicated. If his temperature cannot be kept up to normal he should be given hot colonic irrigations and sometimes hot coffee by rectum.

Lacerations of the scalp have a sterile dressing applied and, after the patient has reacted from shock, the wound is thoroughly cleaned and explored and if there is no evidence of fracture the skin edges are trimmed away and the wound closed. We do not feel that closure of the laceration by an intern in the emergency room on the admission of the patient is a justifiable procedure. Coleman has called attention to this, since if the wound becomes infected and later on it becomes necessary to operate for some intracranial complication meningitis will almost certainly follow. In fractures of the base with a discharge of spinal fluid or blood from the ear, the external auditory canal is gently swabbed out with alcohol and a sterile dressing applied over the ear. The auditory canal should not be plugged nor should antiseptics be poured into the ear.

The temperature, pulse and respiration each has its significance and should be closely watched. A temperature of 102° and over should be controlled by ice bags and cold sponging, since patients may die of hyperpyrexia. Excessively high temperature usually means severe injury of brain substance and is of grave prognostic import.

A pulse rate of 120 on admission generally denotes shock and, as we have said before, the usual treatment for shock should be promptly instituted and the pulse closely watched to see if it responds. Heart stimulants are contraindicated and digitalis is probably of no value. If the pulse drops below normal it denotes cerebral irritation, either from hemorrhage or edema, and

an effort should be made to determine the cause of the slowing pulse rate since rapidly accumulating localized hemorrhage requires prompt operative interference and edema requires dehydration and spinal drainage.

If the respiratory rate is in excess of normal it also denotes cerebral irritation and when double the normal rate will produce hyperventilation and alkalosis. A respiratory rate much below the normal requires constant watching and oxygen should be at hand to be used as an emergency life-saving measure should anoxemia occur.

A certain percentage of patients, probably 10 per cent, will not survive this initial shock. Those who do, require our most intelligent and constant observation. When the period of shock is passed, indicated by a dry skin, a slowing of the pulse rate, a stabilizing of blood pressure, usually in from six to twelve hours, a spinal puncture is done under manometric control and, according to Fay, our treatment from then on is largely guided by the absence or presence of blood in the spinal fluid. Fay believes it has been proven that fluid leaves the cerebral spaces through the Pacchionian bodies acting as filters; that they filter out red blood cells and leave them behind and that it takes about ten days for hemolysis to occur and that during this time, as long as blood appears in the spinal fluid, it should be removed mechanically by spinal puncture. Bagerly has shown that blood in the subarachnoid spaces produces a meningeal irritation which later results in spasticity and other evidences of disturbed cerebral function. If no blood is found at this initial puncture the subsequent treatment of the patient consists of such dehydrating methods as intravenous administration of 50 per cent glucose, small amounts of saline intravenously, salt by mouth, magnesium sulphate by mouth or bowel, with only an occasional spinal puncture in case there are additional evidences of increasing cerebral tension.

Fay claims that one of the most important features in the treatment is the reduction of the total intake of fluid; that the total quantity should be limited to 600 c. c. a day where repeated tappings are not necessary; that if bloody fluid is found and the tappings are repeated at six, twelve or twenty-four-hours intervals in order to drain the blood from the cerebral spaces it may be necessary to give as high as 900 c. c. of fluid in twenty-four hours in order to replace the cerebral fluid drained out, but this amount of 900 c. c. should not be exceeded. He claims that an intake of fluid, not to exceed 600 c. c., will keep the cerebral spaces comparatively dry. We try to keep an accurate chart of the urinary output and fluid intake and to keep our fluid intake as nearly as possible within the limits of the urinary output. In unconscious patients, voiding involuntarily, this of course is not possible. Fay also claims that the fluid intake should be limited to 900 or 1,200 c. c. a day for an adult for many months afterwards to prevent the occurrence of headaches and other changes incident to cerebral irritation. The pediatricians tell me that a child can stand relatively more fluids than an adult and that it is possible to give young children the same amount of fluid that we would give adults, since normally they take care of more fluid a day than the average adult. The neurosurgeon, however, insists that the child should have approximately the same reduction in fluids as the adult and limits the intake to 500 c. c. a day. After this period has passed and the patient has regained consciousness or has become fairly well stabilized his head should be x-rayed, since it is often of medico-legal importance and may be a help in prognosis, although only in occasional cases it is any particular guide in the line of treatment.

Fay calls attention to the fact that the majority of men watch the systolic blood pressure reading when, as a matter of fact, it is the diastolic pressure that tells the patient's true condition and he considers a diastolic pressure of 60 as on the border line of safety. An effort should be made to maintain it above 40 mm. of mercury if possible by drugs that stimulate the peripheral vasomotor bed and by the intravenous administration of 50 per cent glucose.

The after treatment of these patients is particularly important. We feel that the patient who has only a few minutes of unconsciousness, a so-called cerebral concussion, should remain in bed for from ten days to two weeks; that the patients with evidence of severer cerebral injury regardless of their feelings and their desire to get up should be kept in bed from four to eight weeks; that both their mental and physical activities should be restricted for a much longer time; that their fluid intake should be limited and that alcoholic indulgence should be absolutely contraindicated. We believe that in the case of children a year in school should be missed rather than return them to a too severe mental task too early. It is only by prolonged, careful supervision that we can hope to return

these cases to a normal life, free of headaches, mental lapses and behavior problems. We owe it to them and to the community at large to guard them until their complete readjustment has taken place.

Medical Arts Building

DISCUSSION (*Abstract*)

Dr. H. D. Van Schaick, Jacksonville, Fla.—About 70 per cent of fractured skulls will get well with ordinary treatment. From 10 to 20 per cent of the patients will die and from 10 to 20 per cent need other than the so-called medical treatment.

The most important thing is a treatment for shock. That supersedes all others. The treatment of shock should begin when the patient is picked up. He should be surrounded by hot water bottles. The treatment should not be delayed until he has been brought to the hospital, his head has been sutured, and he has been x-rayed. Until he reacts from shock, one of the foremost things is the treatment of that condition.

A very valuable agent for this is caffein in large doses. Morphine and saline may be used. There may be difficulty in differentiating between shock and compression. High temperature is found in shock, there is restlessness, and the respiratory rate and pulse rate are irregular.

There are a few things on which physicians are in accord. One is the indications for operation. All agree that we should operate upon severe depression or depression with symptoms; upon compound fractures; and in the presence of massive hemorrhage, which occurs in 5 per cent. But we must remember that 95 per cent of all fractures of the skull will have from one to two hundred grams of hemorrhage somewhere in the cranium. The average is forty grams.

Physicians disagree on the treatment of increasing intracranial pressure. The most outstanding man against the use of spinal puncture is Dr. Dandy. He has told me several times that spinal punctures are absolutely detrimental to a patient, but I understand recently he has changed his mind, and I believe sooner or later spinal punctures will be used. I have no doubt that many people are saved by this procedure, many more than die from it.

After the operation, or after any other treatment, the patient needs prolonged rest: rest in bed, without alcohol, tobacco or mental activity, for a period of weeks or months. Rest is essential.

The individuals who continue to have symptoms of brain damage, such as irritation or change in mentality, must undergo a complete examination, that is, x-ray, a neurological examination, and air injection, because many of them will be found to be suffering from accumulation of blood or accumulation of fluids, pooling of cerebral spinal fluid or at times an accumulation of air for which proper treatment may be necessary.

An important thing is the attitude of the physician, the family, and the lawyer toward a man with a brain injury. Do not keep repeating to the patient: "You have had a terrible injury and you are lucky to be alive," because if a man is sub-standard to start with, not .100 per cent physically, like those who were shell shocked during the War, you add to the injury by repeating this.

Dr. Edward T. Newell, Chattanooga, Tenn.—It is necessary to diagnose the condition of the patient's brain; not his skull, and not his scalp; for when we have correctly diagnosed the condition of the brain, we know what to do.

When we have a brain injury or concussion, a momentary unconsciousness, without trauma to the scalp or fracture of the skull, we put the patient to bed for two weeks or longer if necessary. This is all there is to be done. The patient should completely recover. No medication is required.

A more severe injury, contusion of the brain, would necessitate a prolonged observation and disability. If the symptoms justify it, the patient should be dehydrated.

If the patient has a still more serious condition, laceration of the brain, the treatment is just as definite. The patient should first be dehydrated or have a spinal puncture, which is diagnosis and treatment. If there is a depressed fracture this should be elevated; if there is hemorrhage, the patient should be operated upon at once, whether it is extradural or subdural, provided he is not brought in to you in profound shock. As the essayist has said, shock should take precedence over everything.

It is not usually possible for edema of the brain to develop immediately following the accident. Therefore, one should use normal saline with about 5 per cent glucose to support the patient in shock, and also, as has been stated, give him caffein, camphor, and coffee by rectum, use heat and the other well known treatments for shock. However, if the brain tissue is badly traumatized, is oozing out, and you have reason to believe that there is concealed bleeding irrespective of the condition of shock, he should be operated upon, preferably under local anesthesia.

I am at variance with most of the speakers in regard to the use of the x-ray. I know that taking a man who has had a serious brain injury, shaking his head from side to side, twisting his neck around, pulling him up on a Bucky diaphragm, is not good treatment. But we can, if we are in doubt, put the patient to bed and while he is being treated for shock, with a portable machine and screens, get nearly as good x-rays as in the main x-ray department. If we are not satisfied with this evidence, we can later take the patient to the x-ray department and have more perfect x-rays made.

The condition may be so palpable that we do not need x-rays. However, it is very satisfying to know whether we have a depressed fracture and the extent of the fracture lines. We cannot always tell this by palpation and inspection. It is well to know if we have a fracture extending into the base. The patient may not be bleeding from the ears or nose to give the indisputable evidence. We may also gain information in regard to intracranial pressure from the films.

The dehydration treatment in severe brain trauma is the method of choice. We may use 50 per cent glucose in small quantities or a larger quantity of a 25 per cent solution.

I also advocate spinal puncture under certain conditions, especially in reducing the pressure.

The last thing we should do is a subtemporal decompression; yet there are times when only a decompression will save the patient.

We must return to the more conservative methods

of treatment and by this return we shall obtain a higher percentage of cures in basal fractures and in severely traumatized brains than we did ten or fifteen years ago, when it was the custom to do a subtemporal decompression in the majority of cases.

Dr. Rawls (closing).—I believe that all patients should be operated upon under local anesthesia. General anesthesia is too severe a test for these cases.

I should like to emphasize, in closing, the remarks of Dr. Van Schaick. Most of these cases are medicolegal. The patient's lawyer and his family want to feel that he has been terribly injured, permanently, until the case has been settled; and the physician can intensify that feeling if he lays too much stress upon it. We try to insist that the patient keep quiet; that he cut down his fluid intake and alcoholics, but outside of that we do not lay much stress upon the fact that he may have some permanent mental injury if we can control him without that threat. We do not stress the behavior problems that he may have. If we stress these symptoms, the patient will have them anyway, and we cannot tell whether they are genuine, accidental, connected with the injury or wholly imaginary.

CHRONIC PEPTIC ULCER*

By JOSEPH W. LARIMORE, A.B., M.D.,†
St. Louis, Mo.

The successful treatment of peptic ulcer has not been attained by any specific medicament, but only by means of those systems of management which have provided opportunity to the natural healing faculties of the tissues. This is because the ulcer-bearing tissues retain their protoplasmic integrity and structural resistance and fail to heal only when hindered by a persistent retarding influence. The unimpaired normal vitality of these tissues protects every individual from the frequent, occasional, subclinical, acute ulcer, which heals directly and quickly in the absence of any interfering chronic factors.

The prompt repair of a large ulcer crater, and even of a penetrating pocket, when favorable luminal conditions are maintained by medical management, is repeatedly demonstrated by roentgenology. The healing of an ulcer without any direct attention (excision, infolding, cauterization) after other surgical interference (gastroenterostomy, pyloroplasty) is prompt. The healing of gastric or duodenal suture is prompt and complete; and even the borders of an ulcer may be sutured with good results. Experimental ulcer is transient and unsuccessful unless the initiating lesion is accompanied by some impairment in the motility and by changes in the chemistry of the gastroduodenal segment. The search for causes of the essential break in the mucous membrane has overshadowed consideration of other factors which are *sine qua non* for the development of chronic peptic ulcer. Greater importance must be accorded to those factors which impede healing than to those which initiate the tissue defect. A more critical analysis will show that the structural change has had a starting place in functional derangement. Causes for injuries to the mucous membrane are numerous, and they may be grouped as vascular, toxic, infectious, neuropathic and chemical. Their discussion is not germane to this thesis. The acute ulcers initiated by these various agents are not self-perpetuating, except when the agent is a specific disease (syphilis and tuberculosis) which, by its own nature, is progressively destructive. Such diseases are not included in the premises of this discussion. Food is not a direct noxious factor. Its influence is more indirect through its disturbance, by abuses in quantity and character, of the motility and secretory capacity of the stomach.

Fresh defects in the mucous membrane, from any cause, heal immediately or become acute peptic ulcers, which, without chronicity factors, will be subclinical or transiently clinical, except when one of the pathological disasters of perforation or hemorrhage promptly supervenes. Rarely will the tissue destruction of the acute mucosal trauma be so large as, of itself, to initiate the persistent chronicity factors. Clinical peptic ulcer is a chronic pathological process, even when its clinical symptoms show acute exacerbations. The chronic ulcer is the sequel of an acute ulcer. The sequence is actually rare. Confusion has resulted in the use given to the adjective "acute" and its use is here confined to its pathological rather than to its clinical inferences.

The term peptic ulcer includes both duodenal ulcer and gastric ulcer. These ulcers are similar in anatomical characteristics, especially in histology. The same type of variation occurs in the gross characters of both gastric and duodenal ulcers, with greater dimensions permitted to the gastric lesion because of its site and with the significant exception that the gastric ulcer may become malignant. The differences in the

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PEPTIC ULCER

Anatomical, Physiological and Personality Factors in the Development of Ulcer
Arranged to Approximate the Sequence of their Interaction

Extra-Gastroduodenal Factors	Gastroduodenal Pathophysiology	Advance of Anatomical Pathology		Counterinfluences for Healing
Focal infections (extra-abdominal) Appendical infection Gall-bladder infection Colonic and rectal infection	Transient disturbance, if any, or Hemorrhage or Perforation	Initial, Simple, Mucosal Defect		Cytological health Healing spontaneous Care of focal infections
(Specific disease: gumma, tubercle)	(Progressive Disturbance)	(Specific, destructive, mucosal defect)		(Specific treatment)
Pylorus Functionally Impaired		Duodenal Ulcer	Gastric Ulcer	Ambulatory Treatment
Habitual health violations Irregularity of ingestion Disordered diet Abuse of condiments Confections Beverages Alcoholics Tobacco Focal reflexes Appendical disease (60 per cent) Gall-bladder disease (6 per cent) Colitis Pelvic disease Epigastric hernia Focal infections	Secretory Confusion Failure of conditional secretion Secretion-food disharmony Gastroduodenal hypertonicity Gastric hypermotility Hypersecretion Hyperacidity Erratic pylorus (hypertonic Vomiting Bulbar spasm Intra-bulbar non-neutralization Duodenal Hyperacidity Duodeno-gastric reflux impeded Nocturnal pain Peritoneal pain	(Duodenitis) Mucosal ulcer Mural crater Penetrating crater Periduodenitis Pericholecystitis	(Pyloric gastritis)	Health discipline (prolonged) Regularity of meals Restored conditional secretions Prescribed diet Proscribed abuses Abstinence Neutralization Non-acid, absorbing diet Antacids Atropine Appendectomy problematical Cholecystectomy independently Care of colitis Eradicate focal infections Bed rest
Stomach Alone Functionally Deranged				Regularity of hygiene
Erratic hygiene Systemic fatigue, accumulating overwork, sedentary work, lack of sleep, dissipation, worry Malnutrition (avitaminosis)	Gastric hypomotility Gastric hypotonicity Abolished interdigestive rest Prolonged secretion Continuous acidity Disordered peristalsis		(Acute ulcer) Mucosal ulcer Mural crater Inflamed musculature Irritated myenteric plexus	Neutralization (diet and chemical) Physical recreation Bodily repose or exercise Adequate sleep Dispel worries and fears Dietetic adequacy
Stomach Organically Impaired Also			Callous accumulation	Hospitalization
	Disabled peristalsis Gastric retention (non-obstructive) Prolonged acidity Vomiting (irritative) Pocket retention Local, continued acidity		Perigastritis Penetrating crater Accessory pocket Non-retentive (distal) Retentive (proximal) Invasive pocket	Surgery Essential Physiological restoration Excision of pathology
Pylorus Organically Impaired		Pyloric stenosis		Medical trial
	Pylorospasm Duodeno-gastric reflux stopped Hyperacidity of gastric ulcer Gastric stasis Transient Recurrent vomiting (accumulative)	Gastrectasia Juxtapyloric ulcer 1 per cent Edematous stenosis Cicatricial stenosis Periduodenitis, perigastritis		Surgery essential
Fortuitous Pathological Disasters				
Exsanguination Shock	Stasis and vomiting	Hour-glass deformity Hemorrhage Perforation		Surgery Transfusion and surgery Surgery imperative

clinical manifestations of these ulcers are due to the different reactions of their proper segments. The pain of ulcer may arise from the lesion, from the segmental musculature, and from the peritoneum, but its occurrence is timed by segmental function. Unlocalized irritation, gastritis and duodenitis, or merely disordered function, may mimic ulcer. There is normally an inseparable relationship between structure and function, and the clinical symptoms of ulcer come more from the organ involved than from the lesion itself. Many apparently contradictory facts about ulcers are explained when this is considered. Duodenal ulcer has a restricted location and varies little in its manifestations. The simple ulcer gives classical symptoms easily recognized and seldom mimicked. Gastric ulcer has wide latitude of location with more varying influences upon the multiple functions of the segment. Its symptoms are thereby much less characteristic and are often simulated by less circumscribed disease (gastritis) and by purely functional disturbances, making clinical diagnosis more uncertain. The rare juxtapyloric or pyloric ulcer is anatomically different only in site, and by this circumstance has more urgent clinical manifestations.

Peptic ulcer has a very definite life history, progressing definitely, although with varying speed, through a succession of pathological changes. Two essentials are necessary for the ulcer's inception: first, a defect in the continuity of the mucous membrane; and second, the continuous digestive removal of the devitalized tissue. The latter cannot occur without the former and the former will, by the initial premise, promptly heal without the interference of the latter. The initial injury is important because digestion of the stomach wall will occur only after injury. The varieties of normal gastric epithelium are tolerant and self-protective to peptic digestion and to hydrochloric acid. The proteolytic digestion which provides the second essential is activated by the hydrochloric acid of the gastric secretion. This acid thereby gains its dominant relation to the origin and persistence of chronic peptic ulcer. This relation would still exist even if the theories of "anti-pepsin" failure could be proven, and so definitely do the clinical and experimental facts center about active acidity that trypsin, the other alimentary proteolytic enzyme, has been dismissed with little attention. Hyperchlorhydria, hypersecretion, or prolonged acidity are constant concomitants with ulcer; neutralization is the end sought with both medicinals and diet; the esophagus and jejunum are seldom ulcerated and the latter only after gastroenterostomy done for ulcer and not after the same operation in the presence of the achlorhydria of cancer; ulcers of the esophagus occur only from chronic regurgitation through an insufficient cardia; the experimental round ulcer arises only when associated with an improper acidity; surgical efforts seek to reduce acidity and gastric retention; and achlorhydria is unaccompanied by ulcer, although by the failure of acidity the protection from ingested, mucosal infection is removed. Diversion of the alkaline secretions from the duodenum of the experimental animal consistently results in the production of typical duodenal ulcer. Ulcers occur in those parts of the stomach and duodenum where all the elements, which may increase acidity, converge.

Hydrochloric acid as an element in the digestive processes is normal to the stomach and the duodenum and it follows that some abnormality in its physiological attributes is necessary to create for it an essential place in the development of peptic ulcer. The stomach tends to maintain a normal optimum level for gastric acidity, lower than the secretory concentration. The faculty is partially or totally lost in disease. The normal stomach has a mechanism whereby it regulates the acidity of its contents to the amount or to the character of the food ingested. Whether or not this mechanism is monophasic is unproven. Neither is it proven that duodenal regurgitation is an integral part of the normal digestive cycle or that the mucous secretion of the antrum is a major factor. It is more than merely probable that the gastric mucosa forms its secretions according to digestive demands and ceases production when the demand is satisfied. Abnormal influences upon the body of the stomach, the pylorus, and the duodenum cause a failure in the normal control which harmonizes the activity of the gastric glands and the quantity of their secretion to the needs of gastric digestion. The interdigestive quiescent phase is essential to the normality of the stomach. Rest for the stomach is achieved by an intermittency of its work quite equal to that obtained for the heart, although by a less refined mechanism. Gastric work is exposed to many voluntary abuses. The excess functional capacity, which exists generally in all organs as a margin of safety, is more necessary as a physio-

logical law to permit adequate rest to an organ than to meet its crises of effort or trauma.

The essential physiopathology of the gastroduodenal segment for the development of ulcer is uncontrolled acidity of the gastric juice, resulting because of the various chronicity factors. The motor and the secretory mechanisms are closely coordinated in their nervous control and their functional disturbance occurs concomitantly. The abnormal variations in the status of hydrochloric acid are occasioned by hypersecretion, gastric hyperperistalsis or gastric retention. Finally, there occurs a failure of the duodenal regurgitation, which is a natural safety mechanism for neutralization of any causal or chronic hyperacid gastric state. These disorders arise because of extrinsic and intrinsic factors and they constitute intragastric or intraduodenal conditions impeding the natural healing faculties of the tissues. This interference is the deciding factor in the development of clinical peptic ulcer. Peptic ulcer is initiated when the functional disorders of the gastroduodenal segment promote ulceration of an accidental mucosal defect. Either circumstance may occur independently without progressing into the syndrome of round ulcer, but together they occasion a progressive excavation. Rarely they are interacting, either one bringing forth the other. The functional derangements may be followed through the life history of ulcer, when first the pylorus is functionally impaired or the stomach alone is only functionally deranged and later when the stomach is also organically impaired, and finally, when the pylorus becomes organically impaired. The accompanying chart has been arranged to exhibit the many factors of peptic ulcer according to the sequence of their interaction.

The role of the gastric juice in the etiology of peptic ulcer should not be emphasized to the neglect of the importance of gastric motility, nor *vice versa.* They are in fact largely complementary. The dominant, anatomical and physiological position of the pylorus in the cycle of normal gastric function is obvious, and its physiological derangements are shown to be determining factors in the syndrome of chronic ulcer. The pylorus is often indirectly disturbed by reflex irritation from remote points (such as appendix) and by autonomic nervous system instability. The clinical association of appendicitis and cholecystitis with peptic ulcer is frequent. To explain this as cause and effect upon the basis of transferred infection is attractive, and the lymphatic and vascular drainage from the appendix into the upper abdomen offers such avenues. Acute ulcer doubtless does occur because of infectious metastases from these abdominal and other foci. It is, however, more than probable that localized extra-alimentary abdominal disease disturbs the gastroduodenal segment reflexly, and merely alters its motility and chemistry in a manner to favor the development of chronic peptic ulcer.

The pylorus is definitely integrated with the motor and secretory activity of the stomach. Although the secretory confusion and disharmony, which results from irregularity of ingestion and disordered diet, may be well tolerated by the stomach and duodenum, impairment of the pyloric function will finally occur from these continued health violations and from focal reflexes. Gastroduodenal hypertonus is produced and is manifested by pyloric hypertension, gastric hypersecretion, hypermotility and hyperacidity.

The rapid gastric emptying which occurs with duodenal ulcer is significant. It has been considered that the hyperperistalsis of the stomach, usual to duodenal ulcer, overcompensates by *vis a tergo* a hypertonus (spasm) of the pylorus, but pylorospasm does not occur in early simple duodenal ulcer without direct involvement of the pyloric ring and muscle. Gastric hyperperistalsis is a part of the gastroduodenal hypertonus. The resulting gastric hypermotility, characteristic of simple duodenal ulcer, is an essential factor in allowing the gastric secretion to appear in its absolute secretory concentration, since a secretion of a constant concentration, normal or increased, into a steadily diminishing content will produce a continuous rise in the percentage of acidity. This high concentration of acid then persists because hypersecretion (prolonged) accompanies the reaction. The presence of gastric juice of full acid strength will cause no untoward gastric effect, but the corrosive action of the undiluted acid upon the duodenal mucosa has been demonstrated. This mucosa is damaged by the relentless acid bath and peptic digestion is thereby permitted and favored. Hydrochloric acid may thus act dually, as an irritant to the duodenum when in full concentration, and as the activator for the peptic digestion of the resulting devitalized tissue.

From these considerations, it is evident that duodenal ulcer may be caused by gastric hyper-

secretion and hypermotility which arise from intrinsic and extrinsic influences, and which allow the vigorous and prolonged bathing of the duodenal bulb by hyperacid gastric chyme. Such action is resisted by the alkaline potentiality of the duodenal fluids. When this is overbalanced, the uncontrolled hyperacidity is capable by itself of producing duodenitis, erosion and mucosal ulcer. This, more than mechanical and vascular factors, explains why the first portion of the duodenum is the seat of ulcer. Experimental duodenal ulcer may be brought about by surgical elimination of the alkaline secretions pouring into the duodenum beyond the pylorus. A duodenal ulcer may also be initiated by an accidental, acute traumatic or pathological defect in the presence of the chemical imbalance before this, by its own action, would cause erosion and ulceration. The ulcer, by its presence, elevates tonus and thereby aggravates the gastric secretory and motor disturbances. Irritability and spastic contraction of the duodenal bulb prevents the neutralization of the intersurface chyme by the alkaline duodenal juices and digestive action persists. This spasm of the bulb, together with any pylorospasm which may reflexly result from remote sources or from juxtaposition of the ulcer, will establish the abnormal chemical content by obviating entirely the safety duodenal neutralizing reflux into the stomach. The ulcer will progress fortuitously according to the anatomical changes in the lesion, and may eventuate in penetration, in hemorrhage, or in perforation, and when the syndrome has remissions, as is especially characteristic of duodenal ulcer, the recurring healing fibrosis and the periduodenitis produce increasing induration and finally mechanical pyloric obstruction.

Among the differences between duodenal ulcer and gastric ulcer are the greater incidence (almost total) of hyperchlorhydria in the former and the frequency (almost one-half) of lowered acidities in the latter. Gastritis of a chronic type is the explanation often given for this lowering of the acidity with gastric ulcer. Gastritis is not essential. Somatic conditions more often cause the hypoacidity. Residual gastric secretion, found in excessive amount in the fasting stomach and in the interdigestive phase, is abnormal and is of great significance among the antecedent chronicity factors for gastric ulcer. Gastritis may pass through a long course from hypertrophy to atrophy, from hyperacidity to anacidity without localized chronic ulceration, except when continuous work is imposed upon the stomach.

Gastric ulcer occurs by a somewhat different chain of circumstances than duodenal ulcer. The prolonged and uncontrolled action of the gastric chyme, even with a low rather than a high acidity, is the fundamental chemical derangement. If not impossible, it is improbable that the altered chemistry can ever be the active agent in initiating gastric ulcer as it is in duodenal ulcer. Factors, however, which disturb the restriction of secretion and of gastric acidity to the period of digestive needs are fundamental. Among these are, first, the irregularities of ingestion in time, in quality, and in quantity which obviate the conditioned reflexes of (appetite) secretion; second, the gastric hypotonicity and hypomotility which come from erratic hygiene, emotional states, chronic fatigue, and secondary debility, and from precursory intrinsic disease (gastritis). Beaumont found that after expulsion of the last particle of chyme the stomach becomes quiescent, and no more juice is secreted until after a fresh supply of food is presented for its action or some other mechanical irritation is applied to its normal coat. Abolition of interdigestive rest interferes with the healing of any acute accidental defect of the mucosa and the lesion progresses from a mucosal ulcer into a mural crater with inflammation of the muscle and irritation of the myenteric plexus, from which disordered peristalsis and gastroparesis result, accentuating the now continuous character of gastric work, allowing no opportunity for healing. It seems more probable that to be effective any accidents to the mucous membrane should follow upon the already established ground work of a functional prolongation of effective gastric acidity. The pathology, thus favored, progresses with varying rapidity to enlargement, callous accumulation, perigastritis, penetrating crater or invasive pocket, eventuating in fixed organic impairment of the stomach, disabled peristalsis, non-obstructive retention and prolonged acidity.

In gastric ulcer not directly involving the pylorus the stomach is hypotonic rather than hyperperistaltic. The ulcer produces a reflex gastroparesis that effects both the pylorus and the stomach. Secretion is less active and the safety mechanism or duodenal regurgitation is available through a relaxed pylorus. This status is, however, reversed if the pylorus becomes involved.

The pylorus is not irritated in gastric ulcer unless by juxtapyloric ulcer or by extension of the perigastritis. A gastric ulcer which involves the pylorus increases the gastric muscular tonicity and also stimulates greater secretion. The usual (with gastric ulcer) inhibitory influence is overbalanced and an hypertonicity supervenes. Pylorospasm, then resulting, impedes the duodenal safety regurgitation and hyperacidity results. The improbability of chemical (corrosion) initiation of gastric ulcer and the usual early free duodenal reflux through an undisturbed pylorus are reasons for the less frequent occurrence of gastric ulcer than of duodenal ulcer. The severe night pain of ulcer, whether gastric or duodenal, evidences the encompassment of the twenty-four hours by abnormally continuous gastric activity and the complete interference with duodenal regurgitation. This latter is usually due to pylorospasm, which, it is obvious, is the most undesirable single factor to appear in the syndrome of ulcer.

The late pathological changes of either duodenal or gastric ulcer may organically impair the pylorus and stenosis results; the duodeno-gastric reflux, previously only hindered, is now stopped; the actually high acidity of gastric ulcer develops; and gastrectasia eventuates.

The ulcer syndrome is not one of either full pathological momentum or unretarded healing. The ascendency of either the factors of ulcer development or of those favoring tissue repair varies and determines the speed and the degree of the advancement of the pathology or of the healing of the lesion and recovery of normal function. An approach to equilibrium between the factors of development and repair produces an indolent pathology. The destiny of an ulcer depends very much upon the adverse factors to which it is exposed and upon the probability of removing those factors. The unsatisfactory activity of the protective measures at the disposal of the body is too often ascribed to their pathological absence instead of more simply to interference with their action.

The extraneous factors, which create interference, arise from a hygienic lawlessness of which many patients are honestly unaware. The recurring cycles of the digestive function become more or less disordered by improper and irregular diet, by erratic hygiene, by bodily fatigue accumulated from emotional stress, from excessive application to sedentary work, from the lack of sleep, and from actual dissipation and by the abuse of tobacco and alcohol. No single, essential function of the body, of any system, is exposed to greater perversions and abuses than is the alimentary tract, and of it no part more than the stomach. Its endurance is phenomenal and its normality has almost gyroscopic stability.

In applying these considerations to the management of ulcer it is emphasized that treatment can adequately be conceived only after full diagnosis of the anatomical and physiological status in each case of ulcer, together with an assessment of the general systemic factors and associated disease and of the personal habits of the subject, if not also of his personality. The life history of ulcer moves in a definite progression and the particular stage of its evolution and regression presented for treatment should be determined. The tendency inherent in all natural factors is most favorable to the repair of the lesion, especially by the fundamental circumstance that the tissues are cytologically healthy and awaiting the opportunity to heal. The acute peptic ulcer will heal rapidly unless abnormal duodenal, pyloric and gastric functional conditions, which are principally caused by extragastroduodenal factors, and which are amenable to medical management, promote its anatomical, pathological progression and finally create complicating mechanical factors, which crystallize the syndrome and require surgical correction. The medical problem of ulcer is to correct and to disestablish the factors which promote the development of ulcer, and the problem remains primarily medical, even though untreated or mistreated the syndrome passes through surgical complications. Ideal medical treatment of early ulcer would allow no cases to develop attributes requiring surgical correction. It is a correct and essential conception that the healing of the local lesion, although of first consideration, is not of greatest importance. The cure of peptic ulcer connotes certainly the production of a sound epitheliated scar, but healing of the ulcer does not signify nor bring about physiological restoration of the ulcer-bearing segment. Only correction of the syndrome of chronicity factors will do this and at the same time stop an otherwise recrudescent pathology. The effort for this dual result must necessarily extend beyond the relief of symptoms and the roentgenological disappearance of the ulcer crater.

Primarily, control of the acidity will provide the opportunity to heal and justifies direct active

neutralization. This alone will initiate the repair processes in all except the most extensive lesions. If neutralization can be maintained the local repair, in many instances, will become complete. There is no doubt of the efficacy of the so-called alkalinization treatment and there is a rational use of chemical neutralization in the early urgent stages with a greater and increasing reliance upon dietetic protection in the subsiding and convalescent stages of the ulcer syndrome. The danger of therapeutic alkalosis as a contraindication to chemical neutralization is overemphasized. It can easily and with certainty be prevented by a discriminating use of antacids. Alkalinization, however, will not dispense with the necessity for the regularity of a proper diet in re-establishing the normal digestive cycle. Too long continued alkalinization will interfere.

Several systems for the treatment of ulcer are based upon the improvement gained by neutralization and by aspiration of the stomach and by gradual increases in multiple feedings of restricted diets. These systems spring from the needs of advanced ulcer, and by their most unfortunate inference that ulcer treatment can be standardized, and by their indiscriminate application to ulcer *per se*, they have worked much harm in retarding the individualization of treatment. Earlier curable phases of ulcer are neglected by this excessive attention to the late types and to an attempt to treat medically the complications of ulcer. Therapy has had difficulty to free itself from classical precepts based upon the original diagnosis of disease in its advanced state, in which complications and terminal status rather than fundamentals dictated the methods employed. Most of these systems for the treatment of ulcer were established early in, if not prior to, the roentgen era, when diagnosis admitted little discrimination between ulcer cases, and so great has been their influence that even now apologies are made for the ambulatory management of early ulcer, which will spare a large waste of effort and of time to both clinicians and patients. Aside from the lack of any necessity for the treatment by bed rest of uncomplicated or medical ulcer, there is the disastrous inference to the patient that such a period is only a vacation from pet habits and indiscretions, and it also is likely to be only an interruption of other unadmitted abuses. Reconstruction of the patient's habits of life in any permanent way can best be done with the ambulatory regime. No other item in treatment is more important. It is impossible to replace by a short, rigorous and radical system of medical treatment the properly extended disciplined regime. Surgery cannot circumvent the necessity. No patient with ulcer can be cured unless by following proper instruction he contributes more to that end than does either the physician or surgeon.

The diet for ulcer must be adjusted to the physiological disturbance; it must not increase the gastric acidity by addition or by stimulation, but should by dilution and by absorption diminish the acidity; it must not exceed the motility of the stomach either by its quantity or character and thus prolong the digestive phase. The quantity of its fluid components should be reciprocal to the amount of retained fasting secretions. Its quantity should meet the caloric requirements of the patient even if the patient must be put to bed to reduce these requirements. It must have regularity in time, which will reestablish recurrent functional cycles, and restore the quiescent interdigestive phase. This means that the larger diet of convalescent ulcer must be followed with careful regularity long after the subjective and clinical evidences of ulcer have disappeared. The diet for ulcer may be a liberal livable diet and need be greatly reduced only for the acute phase or for the more urgent complications. Usually the patient will gain in weight. The accessory instructions to the ulcer patient are of the greatest importance; he should neither smoke nor use alcohol; physical recreation by bodily repose or exercise as may suit the case is advisable; relief from the strain of worry and fear is desirable, and the manner of eating should be leisurely and careful.

Medical treatment is indicated so long as physiological derangements remain independent of the localized ulcer, and surgery becomes indicated only when the structural change establishes an impairment of function.

Medical failure as a surgical indication, when no specific surgical indication can be defined, presumes that there exists an undefined factor amenable to the plastic alteration of structure, or that operative structural rearrangement can improve an entirely non-organic functional derangement. Surgery done from a sense of medical hopelessness rather than from a knowledge of specific indications has only the most general reasons for success. Although undefined indications probably often exist, it is only after analysis of the roentgenological and clinical facts of ulcer

shows that failure has resulted from causes which are operatively removable that surgical interference can have a rational indication. Many of the causes for medical failure and for recurrence of the ulcer cannot be removed or corrected by surgery and, until the advance of the anatomical pathology has crystallized some mechanical factor of chronicity, no true surgical indication can be said to exist. Relapse or recurrence because of the lack of control of the functional factors should lead only to reconstruction of the medical regime and to better control of the patient.

If, by analysis of the clinical and the roentgenological facts, an ulcer presents no surgically removable attributes, the social, economical or intellectual status of the patient can not constitute a surgical indication. The restoration or circumvention of functional, non-mechanical disorders of the gastroduodenal segment is not a certainty of surgery. Socially favored or fortunate patients may nurse and temporize with the less urgent, although actual, surgical indications, and the medical control of such cases may be clinically effective although not truly curative. The ulcer which, because of the manner of treatment, limits earning power or creates incapacity, is either being overtreated or already requires surgery. The failure by the mentally inadequate patient to gain a conception of the need for a continuous regime does not, by that fact, immediately advance the ulcer from the medical into the surgical status. Surgeons should avoid operating upon this case until such time as the pathology has reached a definite surgical status, as it most probably will. The plastic correction can not be done in anticipation.

The fear of malignancy should in no sense be an indication to gastric surgery. Diligent use of the means at the disposal of diagnosis leaves few cases in which any doubt will persist. Gastric ulcers as well as duodenal ulcers can adequately receive surgery because of their definable attributes.

The statistical rivalry between the medical and the surgical management of ulcer misleads no one more than the protagonists. A proper division of cases will allow for a parity of results. All statistics have too greatly ignored the definitions of the individual ulcer, its site, state of advance, complications, the personal character of the patient, the manner of medical management, and the nature of surgical care in all its variations. Statistics of any type of management will always be embarrassed by the results in those patients who expect a medicine or an operation to relieve their discomfort and to spare them the annoyance of diet and other personal adjustments.

This review and analytical arrangement of widely accepted facts concerning peptic ulcer is intended only to offer a practical perspective of a progressive, chronic syndrome which can not be treated upon its generic diagnosis, but only after definition of its current attributes. These fundamental factors, especially those local to the gastroduodenal segment, must be considered before such remote factors as thyroid disease, suprarenal disease or tumors of the diencephalon be accorded specific effect in the occurrence of peptic ulcer and then only when such remote factors can be integrated into the syndrome of local factors which has been outlined. Too much weight must not be given to exceptional associations in a subject holding so much opportunity for confusion. In any discussion as to whether peptic ulcer is a local or a constitutional disease, it must be recognized as certain that the local disturbances of ulcer are tangible and in large measure controllable with definite arrest of the disease, while constitutional considerations are relatively imponderable and difficult to manipulate favorably.

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DISCUSSION (*Abstract*)

Dr. Seale Harris, Birmingham, Ala.—Those of us who have had much experience with ulcer realize it is a very chronic condition. Some years ago the Mayo's statistics showed that their ulcers had existed over an average period of nine years. Friedenwald and Finney's statistics showed their average was nearly ten years. My own statistics showed an average of over five years. I once had a man in my office with a history of recurring attacks of ulcer for thirty years, who had a perforation while waiting for an examination.

The question as to when an ulcer patient is medical and when he is surgical, depends upon many factors. Certainly the importance of making an early diagnosis should be stressed for the reason that the earlier the patient is placed under medical treatment and proper dietary management the greater the possibility of a cure from medical treatment. Most ulcer patients will get well if they are treated medically and by diet. Many ulcer patients recover spontaneously.

There is a great deal to be said about the cooperation between the physician and the surgeon, and when surgery is to be done, it is important for the patient to be prepared for the operation. The ulcer patient with gastrectasis and considerable gastric retention should not be rushed to operation after a day or two of observation. He should be kept under observation for several weeks and prepared for operation.

The dietary management of an ulcer patient for

operation is entirely different from that of a medical case, and I know of nothing that will do more to reduce the danger of acidosis than to diet him for a few days, recalling that a high fat diet produces acidosis. For the last twenty-four hours before any patient is operated upon he should not have any fat, but a high carbohydrate diet, glucose orangeade and glucose lemonade principally.

The idea of taking the bridle off, as they express it, and letting an ulcer patient have what he wants to eat two weeks after an operation is an amazing thing. The gastroenterostomy does not remove the cause as the patient thinks. It takes months for an ulcer to heal after a gastroenterostomy. The following up of these cases is very important.

Dr. Houston this morning read a beautiful paper on psychotherapy which might well apply in treating the ulcer patient. The personality of the doctor treating the patient has a great deal to do with the results. The doctor who is able to impress the ulcer patient with the necessity of dieting himself for some time, of living hygienically, of avoiding over-work, of adherring to the proper diet, not only as to the amount but as to the quality of food, will accomplish the best results.

Dr. L. Carl Sanders, Memphis, Tenn.—In the treatment of peptic ulcer, I wish to emphasize several important points.

(1) Diet is a necessary part of the treatment. The diet should include sufficient caloric, vitamin, and mineral elements to insure proper balance. Written instructions are essential.

(2) *Alkalinization.*—A fractional test meal will determine the quantity of alkali required to neutralize the acid. Approximately 40 per cent of patients with peptic ulcer have a normal acid curve. Larger doses of alkali are indicated when the acid is excessive. When the acids are low, over-alkalinization may be harmful.

(3) *Nervousness.*—Sedatives, such as bromides and atropine, are beneficial in quieting nervous phenomena and reducing hypermotility of the stomach. Physical and mental rest are as necessary as drugs.

(4) *Tobacco and Alcohol.*—Dr. Larimore has mentioned the harmful effects of these two stimulants. We know that patients with peptic ulcer who use tobacco have more gastric disturbance than those who do not. This applies also to alcohol. Both tobacco and alcohol should be strictly forbidden.

(5) *Foci of Infection.*—Whenever possible foci of infection should be removed before medical treatment is begun. If the ulcer is treated surgically, foci should be removed soon after convalescence. All of us have had patients return with unrelieved symptoms after medical or surgical treatment. Examination may show infected tonsils or abscessed teeth. The elimination of these will often be followed by prompt relief of symptoms.

Finally we must realize that the peptic ulcer is a disease which commands the attention and cooperation of both the surgeon and internist. Preoperative and postoperative medical care is as important as the operation.

Dr. J. M. T. Finney, Baltimore, Md.—Unfortunately, we do not know the etiology of peptic ulcer. We might as well admit that to start with. Therefore, the treatment, whether medical or surgical, is necessarily empirical, and we all know how unsatisfactory, as a rule, empirical treatment is. When we know more about the cause of ulcer, we can treat it more intelligently.

It must be admitted that a large percentage of cases are relieved symptomatically, call it cured, if you will, by medical treatment.

We used to hear of the fight between the internist and the surgeon over the treatment of ulcer. We do not hear much of it any more. Every surgeon of experience wants the help of the medical man, and, if he is wise, he will insist upon having it, and he will not operate upon any case until the patient has had the benefit of proper medical treatment. He will also insist upon having the benefit of the medical man's help in the postoperative treatment, because there are many cases of potential cure of peptic ulcer by surgery where failure is due to improper postoperative treatment. The really effective treatment often begins after the operation has been done. When surgery has done away with the faulty mechanical conditions present, it has done about all it can do. The medical man can then do what is needed in the way of proper treatment, looking after the general condition, prescribing proper diet, the proper mode of living. These things are really effective after the faulty mechanics have been relieved by surgery.

Peptic ulcer is not a mechanical problem alone; therefore, it is not a surgical problem alone. It is a combination of the two. We must study the whole patient, the psychological side, the physical side, the economic side. All are of great importance. It is notorious how many busy, over-worked doctors have, or think they have, peptic ulcer. Send them off fishing for a week or two, and their symptoms will disappear. What does that mean? Relief from worry, getting away from the telephone, getting away from all the worries a doctor has, is followed by astonishingly quick relief.

One word as to surgery. Personally, I approach a surgical operation for the relief of duodenal or gastric ulcer (it is more true of duodenal than gastric) with less assurance of success than any other major abdominal condition, barring cancer. Why is this? Because in these cases there is no one single cause for peptic ulcer. You may remove or relieve one set of conditions and perhaps fail to relieve others. I can not get the same satisfactory percentage of relief or cure, if you will, that I can with gall-bladder conditions, for instance, with operations on the large bowel, appendicitis and other abdominal conditions. Therefore, I am conservative about operation for peptic ulcer. We used to say that surgery begins where medicine leaves off. That is not strictly true. They go hand in hand. The last word has not yet been said concerning the etiology and treatment of peptic ulcer.

Just one other word. The pendulum has swung too far the other way, and the continental idea as to partial gastric resection for peptic ulcer has gained considerable foothold in certain quarters. I want to register a strong protest against this entirely too radical treatment. It is a perversion of surgery. Peptic ulcer is not a very mortal disease. It does perforate occasionally; you may get hemorrhages; you do occasionally get obstruction from mechanical causes, adhesions, strictures. But ulcer, as a rule, does not tend to kill the patient. For a thing so small and so relatively innocuous as a duodenal ulcer, I can not see the occasion for taking out half or two-thirds of the stomach. There are cases, of course, of gastric ulcer which ought to be treated radically, and an occasional case of chronic bleeding ulcer, but they are rare.

Dr. J. S. Horsley, Richmond, Va.—This meeting lacks

the pep and smell of the battles we used to have over the treatment of peptic ulcers, but I think it has come to a more logical conclusion.

The type of specialist who knows more and more about less and less we should attempt to avoid. There should be very little distinction between a medical case and a surgical case. They practically merge into one another and as Dr. Finney and Dr. Larimore have said, they demand attention from both sides. To ignore medical treatment in peptic ulcer is even more unwise than to ignore surgical treatment. It is very much like a fracture case. That mechanical part of accurately setting a fracture is necessary, to be sure, but it is only one phase of the entire treatment. Suppose we let the patient go, suppose the man returns to work, uses his leg or arm, as the case might be, without the postoperative treatment. No matter how accurately the fracture has been set you will get a poor result. Surgery merely helps things sometimes. Sometimes it does not. But after you remove the ulcer, or after you correct the condition that led to the ulcer, the medical treatment is necessary, just as rest and opiates are necessary after setting a fracture. All cases of peptic ulcer should be treated medically. Some should be treated surgically, as well as medically, and it is only by that combination, I believe, that we can get the best results.

Taking out a large portion of the stomach for a small ulcer of the duodenum certainly seems to be unwise. It may cure but it is almost like using a routine amputation at the knee joint for an ingrowing toe nail. You will cure the ingrowing toe nail, but the patient pays a high price for the cure. We know too little about the functions of the stomach to undertake a thing like that except in case of absolute necessity. We know there are some cases in which the removal of a large portion of the stomach is followed by anemia. It is not so in all cases. But it seems to me to be wiser and more conservative, if you have a duodenal ulcer, and it is not relieved by medical treatment, to operate upon it locally at first. If there is much infiltration, do a gastroenterostomy, and if that does not do any good, then consider the resection of the stomach.

DIATHERMY HYPERPYREXIA IN CHRONIC AFEBRILE DISEASES*

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PATHOLOGIC PHYSIOLOGY OF FEVER

It is essential that one have some understanding of fever and the associated body reactions before the significance of hyperpyrexia as a therapeutic measure can be appreciated.

The term "fever," though in common use, is by no means easy to define. At the present time we shall think of it as a reaction within the body characterized by certain symptoms and signs, the most outstanding of which are an elevation of body temperature and an increased metabolic rate. These reactions are carried out under the control of the central nervous system, especially of the vasomotor mechanism. The temperature of the body in health is maintained at a normal level by two regulatory processes: first, the physical regulatory mechanism which has to do with the amount of heat loss or dissipation from the body; and second, the chemical process which controls the temperature by increasing or decreasing the amount of heat produced within the body.

The cause of high temperature in disease must be the result of an altered function of one or both of the two regulatory processes. During the rise of fever, or at the onset of a febrile disease, heat production within the body is increased and the heat loss from the body is diminished. Experimental studies indicate that these changes take place in the following manner: when the toxic products of disease reach the heat regulating centers of the brain, heat loss from the surface of the body is immediately reduced by a contraction of the cutaneous blood vessels. The contraction of these vessels causes the skin to become cool and somewhat cyanotic, producing a sensation of cold throughout the body and setting in motion the chemical mechanism already mentioned; this mechanism in turn brings about an increase in heat production. The muscular movements, which so rapidly increase the heat production, give rise to the so-called rigor. The elevation in temperature that may be induced by these processes is probably controlled by the amount of toxin within the blood and the effect it may have on the heat regulating center in the brain.

FEVER AS A DEFENSE REACTION

Fever is a reaction which aids in defending the body against the injurious effects of bacteria and toxic products by facilitating the production of and hastening the action of substances found in the body which combat these agents. But these are not the only functions of induced pyrexia; it is apparent that other factors are at work. Sustained high temperature causes peripheral vaso-dilatation and also has a direct thermic effect on the causative infectious organisms. It is readily noted that practically every one of the self-limiting pathologic conditions is accompanied by fever. On the other hand, it is equally evident that afebrile infections are not self-limiting. Syphilis, gonorrheal infec-

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tions, the arthritides and a number of diseases of the nervous system fall in this category. Efforts to control these with artificial fever produced by diathermy have met with noteworthy success.

Rolly and Meltzer,[10] as well as others, have found that animals kept at a high temperature in a thermostat room develop a much more effective defense against intoxications and infections than those left outside at ordinary temperature. By injecting small doses of bacteria or toxins as they occur in disease, the heated animals show many advantages over the controls by living longer; many of them survive doses that inevitably kill the control animals. They also observed that the defense reaction did not differ in the heated animals and the controls following a single, large, lethal dose of bacteria or toxin. This indicates that the heat gave additional protection by facilitating the production and action of specific antibodies.

In syphilis, repeated experiments have proved that high temperatures have an intense destructive action upon emulsions of virus prepared from specific lesions of man. Bessemans[1] has shown that heat in the form of a continuous bath will cure with certainty syphilis of the testicles in rabbits. He states that the syphilitic focus should be heated in the neighborhood of either 40° C. for two hours or 42° C. for one hour. Following this treatment, the treponema become immobile and disappear after some twenty-four hours or more, and the tissues of the organ rapidly resume their normal microscopical aspect.

According to the work of Corbus and O'Connor reported by Pugh,[9] higher temperatures of 46° to 47° C. for twenty to forty minutes are necessary to destroy the gonococcus, either *in vivo* or *in vitro*.

METHODS OF PRODUCING THERAPEUTIC FEVER

You are already familiar with malarial inoculation, infection of the patient with rat-bite fever and relapsing fever and injection of foreign proteins, vaccines and other toxic substances as a means of inducing therapeutic fever. They will not be discussed here.

The following are some of the outstanding objections to these procedures:

(1) They necessitate giving the patient a disease which may be difficult to cure, or may do irreparable injury to the vital organs of the body.

(2) The desired plasmodia or other infectious agents often are not available.

(3) In many cases the febrile paroxysms stop spontaneously before the desired reaction is produced; in others there is only slight elevation in temperature rather than the typical fever reaction.

(4) The intensity and severity of the febrile attacks cannot be controlled without being stopped altogether.

(5) They offer no means of producing localized temperature of sufficient intensity to kill organisms such as the gonococcus.

(6) Medicinal treatment to the original condition may alter the course of the induced febrile disease.

(7) Certain individuals, particularly of the colored race, seem to be somewhat immune to malarial inoculations.

In an effort to overcome these difficulties, a new method of inducing therapeutic fever has been presented in the last three years. I refer to hyperthermia induced by the high frequency diathermy machine. This form of treatment, devised by H. D. Roop and the author in 1928, was based on the following premises:

(1) The body may be considered as an energy producing and energy dissipating mechanism, which is so balanced by the process of metabolism that its temperature normally remains constant.

(2) If a means be provided whereby an outside source of energy can be dissipated into the body in the form of heat while precautions are taken to prevent radiation of this energy, it is obvious that the energy gain will be greater than the energy loss and the general temperature of the body will rise.

We fulfill these requirements by (1) applying large electrodes to the front and back of the chest and abdomen, (2) carefully wrapping the patient in rubber sheets and blankets to afford insulation against dissipation of heat, and (3) passing through the body high frequency currents of great volume. By the latter part of December, 1928, we had so perfected this procedure that we were able to induce temperatures of 105 to 106° F. without any ill effects on the patient.

In November, 1929, Dr. E. W. Cocke and the author[4] reported before this Association the results obtained and the technic used in treating twelve paretics with a series of eight to twelve treatments. Ours was the first group of

patients to receive this form of therapy, and though the cases were not carefully selected, many of them having been in advanced stages, the results compared well with those reported on carefully selected patients treated with malarial inoculations.

Physiological Changes That Take Place in the Body During Fever Produced by Diathermy.—The most vascular tissues of the entire anatomy are located in the chest and abdomen. When the heated blood from these regions reaches the heat regulating centers in the brain, the physical regulatory process attempts to dissipate this heat by sending more of the heated blood through the peripheral vessels to be cooled. In this manner the pulse rate is increased and the peripheral vessels are dilated. These changes are in direct contrast to those which take place during the rise in temperature associated with febrile diseases. As the heavy blankets wrapped about the patient prevent the blood from cooling as it passes through the peripheral tissues, it returns to the heart still warmer than normal, only to be reheated and again circulated. The skin becomes very hyperemic, and the patient sweats profusely. The metabolic rate is greatly augmented: it may reach 150 per cent or more above the basal line. Mehrtens and Pouppirt[6] have shown that an increased permeability of the meninges occurs after five successive treatments in which the temperature was maintained above 103° F. for at least thirty minutes. The carbon dioxide combining power of the blood is reduced. The total cell count, the blood chlorides, blood calcium and non-protein nitrogen all show a slight increase on account of the concentration of the blood.

PATHOLOGICAL CHANGES IN AFEBRILE DISEASES ON WHICH THE INDICATIONS FOR THIS TREATMENT ARE BASED

Syphilis.—Hyperpyrexia induced by diathermy has been used in all forms of syphilis. Warthin[13] states that the lesions of latent syphilis repeat the essential pathology of the primary lesion, the hard chancre. These changes are predominantly vascular and perivascular, consisting essentially of lymphoid and plasma cell infiltration, derived from proliferation of the vessel wall and surrounding tissue. The lumen of the blood vessels is reduced to a smaller caliber by a peculiar hyaline swelling of the vessel wall itself. The ischemia produced by the reduction in the caliber of the lumina of the vessels ultimately results in chronic fibrosis, which is the chief end result of all syphilis.

These treatments combat syphilis, not only through the spirocheticidal effect of heat upon the organisms, encased as they are in fibrous connective tissue; also through alterations of the pathologic changes themselves by sustained vasodilatation, which increases the blood supply to the ischemic area.

Since febrile reactions have been most successfully used in paresis, our initial application of this form of therapy was in this disease. The results in our first series of cases were better than those obtained with the use of malarial injections and our subsequent cases, as well as those reported by others, have shown an increasingly greater percentage of remissions. By averaging all of the cases reported to date, we find 38 per cent have shown remissions. The treatment has been used less extensively, but with equal success, in other forms of neurosyphilis.

In order to render the treatment more effective and possibly offer a complete cure for the disease, we recommend the use of intravenous antisyphilitic medication just preceding the febrile reaction. Employed simultaneously, all the available therapeutic measures, namely, hyperthermia, vaso-dilatation, and medication within the blood stream, augment each other without additional toxicity. That is to say, the specific drug is brought in better contact with the seat of most active pathology by virtue of the vascular dilatation, and thus has access to the causative organisms at a time when their resistance is already lowered by the elevated temperature. Any febrile reaction caused by the antecedent medication is observed during the routine recording of temperature.

The Arthritides.—In the arthritides, Pemberton[8] has shown that the temperature of the peripheral tissues, particularly of the extremities, is sub-normal, and that this lowered temperature is due to impaired circulation through the capillary bed. He has further shown that by tying off the blood supply to the patella of dogs, changes in this bone similar to those seen in arthritis will occur. Changes in the joints of arthritics are associated with or accompanied by a lowered basal metabolic rate averaging minus 20. Diathermic fever, by increasing the blood flow through the capillary bed and inducing a high metabolic rate, directly antagonizes the incident pathology.

Our work with diathermy in the treatment of this disease, both in chronic hypertrophic and atrophic cases, has been rewarded with most

striking results. Every patient has noticed some relief of pain, increased motion of joints, better color to the skin, and improved health in general. In a number this improvement has been so marked as to simulate a cure; others have been only moderately and temporarily benefited.

The amount of treatment necessary to relieve symptoms varies in different patients and cannot always be estimated by the duration and intensity of the disease. It is believed, however, that better results are obtained with a great number of febrile reactions, as 102 to 103° F. for two to three hours, than with a few intensive treatments. In order to obviate recurrences, treatments must be continued at intervals of five to seven days long after complete relief has been obtained. Other established therapeutic measures should be combined with this form of therapy.

Gonorrheal Infections.—Heat is one of the oldest therapeutic measures used in the treatment of gonorrheal infection. Until recently, however, few, if any, cases have been cured by heat alone. It must be remembered in this disease elevations of the general body temperature are insufficient; to destroy the gonococcus, they must be supplemented by a localized thermic fever of 46 to 47° C.

Duncan[2] has described the most useful means of producing a local temperature of this intensity. Its success is dependent upon the size and arrangement of the indifferent or body electrodes. As will be shown in the lantern slides, this is somewhat similar to the method of electrode application in general diathermic fever. The active electrode for introduction into the urethra, cervix, or fornices, is small, and of the Chapman, Corbus or Peacock type. A thermophore is provided for a thermometer that an accurate temperature may be maintained and observed. The method is most applicable in the treatment of gonorrhea in the female. Unfortunately, in the male the sensitivity of the urethra will not permit a temperature of sufficient intensity to accomplish the desired end result.

Thrombo-angiitis Obliterans.—The principal objection to foreign proteins as used by the majority of therapists in the treatment of thromboangiitis obliterans is that the associated chills and vaso-constriction cause the patient much pain and are conducive to thrombosis. Diathermy offers the best means of inducing therapeutic fever in this condition by producing the fullest dilatation of the capillaries without an initial vaso-constriction. In this way pain and claudication are relieved and superficial ulcers are healed without risk of serious complications.

Bronchial Asthma.—Leopold and Stewart,[5] Miller and Piness[7] and Feinberg[3] have observed that in chronic bronchial asthma intercurrent febrile reactions of a certain intensity frequently produce complete clinical remissions, which last throughout the fever and for some time afterward. These authors have reported thirty-one cases in which they induced febrile reactions with diathermy in an effort to bring about similar clinical remissions independent of infection. The results have been encouraging, but were not equal in every case to those observed in intercurrent febrile diseases. In many, the height, duration and frequency of the induced fever reactions did not correspond to the temperature curves observed in disease, nor were they wholly in accord with the diathermic treatments usually employed. The improvement observed was perhaps due to the effect of diathermy on the sympathetic nervous system. It is possible that continued study of the subject will bring out the most desired temperature curves as well as the types of cases in which it is most applicable. Thus another useful agent to combat this prevalent and dreaded disease may be perfected.

Multiple Sclerosis.—In a recent publication Schmidt and Weiss[11] report their observations with diathermic fever in the treatment of subcombined degenerations, encephalitis, and multiple sclerosis. They state that probably their best results were obtained in multiple sclerosis: such symptoms as spastic paraplegia, intentional tremors, ataxia and vesical disturbances were remarkably improved. Other signs, such as scanning speech, nystagmus and optic atrophy, were not materially changed. Their results in this disease far exceeded their expectations: they observed remissions that simulated or might prove to be a cure. Achievements in subcombined degenerations and encephalitis were less encouraging.

Chorea.—Since Sutton[12] reported gratifying results from the treatment of chorea by the induction of fever with vaccines, this disease also may be added to the list of those which may be amenable to diathermic fever.

SUMMARY

(1) As fever undoubtedly is one of the major defensive measures of the body against disease,

the value of febrile reactions can no longer be denied.

(2) The successful application of induced fever reactions in afebrile diseases is dependent upon one's knowledge of the physiologic changes produced by hyperthermia, as well as upon an understanding of the pathology of the diseases to which it is applied.

(3) The diathermic method has many advantages over other procedures previously used to bring about febrile reactions. Better results have been made possible by the improvement in apparatus and technic.

(4) The results obtained with diathermic fever in paresis indicate this is the treatment of choice at the present time. Pyrexia causes profound dilatation of the arterioles and capillary bed, which are the seat of the most active pathologic changes in syphilitic infections. By giving intravenous antisyphilitic medication immediately before diathermy, we are able to combat the disease at a time when its pathologic processes are altered and the resistance of the treponema is lowered by the high temperature. Thus, we hope to cure the disease in its incipiency, or at least to prevent the serious complications of latent syphilis.

(5) The improvement observed in chronic arthritis so far has been most encouraging. We attribute this to the changes in the existing pathologic process brought about by the reactions to fever.

(6) In gonorrhea, diathermy combats the progress of the disease by the bactericidal effect of heat and through the increased vascularity, which hastens resolution of chronic processes. The proper application of the treatment in the female has brought about gratifying results, but so far its use in the male has not been encouraging.

(6) Although a distinct improvement in symptoms is to be derived from the use of diathermy in the treatment of thrombo-angiitis obliterans, bronchial asthma, multiple sclerosis and chorea, the results obtained to date are not commensurate with those secured in the above mentioned diseases. We hope, however, that future developments in technic will contribute to a greater success.

CONCLUSIONS

It is my belief that our experience with this form of therapy has not been sufficiently extensive to teach us the most efficacious intensity, duration and frequency of these treatments, but we hope that by continued study (and the use of the treatment) the future will reveal this information, making possible still greater achievements.

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DISCUSSION (*Abstract*)

Dr. J. S. Speed, Memphis, Tenn.—We have had considerable practical experience with Dr. King's diathermy machine, and the results from it have been very gratifying. I say this to start with because some of my later remarks may be interpreted otherwise. We have been using it about a year, and in practically all the arthritic cases in which we have used it there has been improvement. Some of them have been very remarkably improved. Some of them almost appear as if they were cured.

But, on the other hand, the reactions in all the cases have not been the same. Some show more improvement than others and in some the improvement is not lasting; in some it is more lasting than in others. In some cases in which we have had a very material improvement with the initial series of treatments there have been relapses, and in their second series of treatments the patients have not responded as well as in the first series. On the other hand, the reverse condition has also been true.

I am prepared to discuss only the arthritic side of this paper. In the treatment of arthritis we can not condemn a method because it does not give us a cure. We have to consider the problems of general focal infection and remote infection; we must consider the general health, orthopedic correction and restoration, of the function; we must consider the allergic side of arthritis. Various measures are adjuncts and integral parts of the treatment. Diathermy has given a great deal of comfort to our patients and allowed us to go on with the other work.

I am satisfied after all that it is the stimulating of the temperature and the metabolism that brings about

the results. In diathermy we have crystallized a method of producing the temperature we want and keeping it up over a long period of time, or as long a period as we think the patient can stand it and needs it, whereas, with the other types of treatment we do not know how long the effect is going to last, or how high it is going to be. It takes a long time to establish a basic dose for the patient. So, this method, I think, is far superior to any other for elevating body temperature.

Diathermy or sub-diathermy is one of the most important and valuable parts of physiotherapy, and I can certainly recommend its use in arthritis.

We know in all cases of arthritis the patients are poor; they are in bad condition, their metabolic rate is low, their hands and feet are cold and moist, they look dead. After these treatments there is considerable improvement.

A temperature of 102 or 103° F. carried on for four hours is perhaps preferable to 104 or 105° for one hour. The number of treatments used will vary according to the patient's reaction. We usually give a series of ten, give them every other day or every three days over a period of time, and then let them rest.

In debilitated patients, in bad condition you can not safely run the temperature up to 105 or 106° at first. There is a definite reaction though it has never been serious or alarming. They are exhausted after one of these treatments. You have to be careful with it.

Dr. Otis S. Warr, Memphis, Tenn.—The therapeutic value of the fever has long been appreciated. Every clinician has seen patients with some chronic ailment who have shown improvement following febrile attacks. I think we all agree with Dr. Speed that the greatest benefits are derived from decided febrile reactions. This is also true of any form of therapy which relies upon heat for its effect. I have never seen such measures bring good results unless they were followed by a definite febrile reaction.

Dr. King has referred to the use of malaria. The same inherent objection applies to all remedies of this type, namely: once injected, we have no control of them. On the other hand, in the measure proposed by Dr. King, we have always a direct control not only of the duration, but of the frequency of treatment.

A great deal of work, both clinical and experimental, will have to be done before we will know in just what cases we may expect results, and what technic to apply in given cases.

Dr. N. H. Polmer, New Orleans, La.—Dr. King's approach to this subject is conservative. He has not let his enthusiasm run away with him.

There are certain mechanical factors which are necessary to produce and maintain this degree of temperature. It is produced by a high frequency generator of accepted power, voltage and frequency. It is maintained by thoroughly insulating the patient against heat radiations by blankets and covering.

It would seem advisable to pay particular attention to the selection of the cases and not give the pyrexia treatment to any patient with cardiac changes, to anyone with a systolic pressure below 95 mm., or when there are signs of pulmonary trouble or known weakness of the patient.

A number of years ago Dr. Curran Pope, of Louisville, reported a case of tabes in which, following intravenous injections, he used diathermy to the cerebrum with good results.

THE ADMINISTRATION OF SERUM IN MENINGITIS*

By GEORGE M. LYON, M.D.,
Huntington, W. Va.

The description of an unusual method of administering serum in meningitis is presented in this report. Before proceeding further, however, may I refresh your memory in regard to certain characteristics of meningococcus meningitis as it affects the infant?

Reliable estimates of the average incidence of meningococcus meningitis parallel closely the incidence noted by Neal[1] as occurring in New York City during a period of thirteen years. In this series of 623 cases of the sporadic type, 23.9 per cent occurred in the first year and 12.7 per cent in the second year of life. Thus 36.6 per cent of the cases occurred in infants under two years of age.

The same observer[2] reported among these patients a mortality rate of 44 per cent for those in the first year of life, 28 per cent for those in the second year, and 16 per cent for those between the ages of two and five years. In a series of cases of the epidemic type, presented before this group last year, Levy[3] reported a mortality of 77.7 per cent during the first year of life, 41.6 per cent during the second, and 18.5 per cent for those between the ages of two and five years. Neal[4] has stated that even with serum therapy they have not been able to maintain a mortality rate lower than 45 per cent in children under one year of age. During epidemics the incidence among infants is relatively less, but the mortality is relatively higher.

While conclusive observations are not easily obtained with regard to the incidence of neurologic sequelae in infants treated with serum, we know that only too frequently are seen cases of post-meningitic hydrocephalus, blindness, deafness and impaired physical and mental development.

We may ask, "Why the difference in mortality rate among those under two years as compared with those between three and five years of age?" The latter do relatively well. Both groups are diagnosed relatively as early. Both groups are exposed to the same chances of receiving a se-

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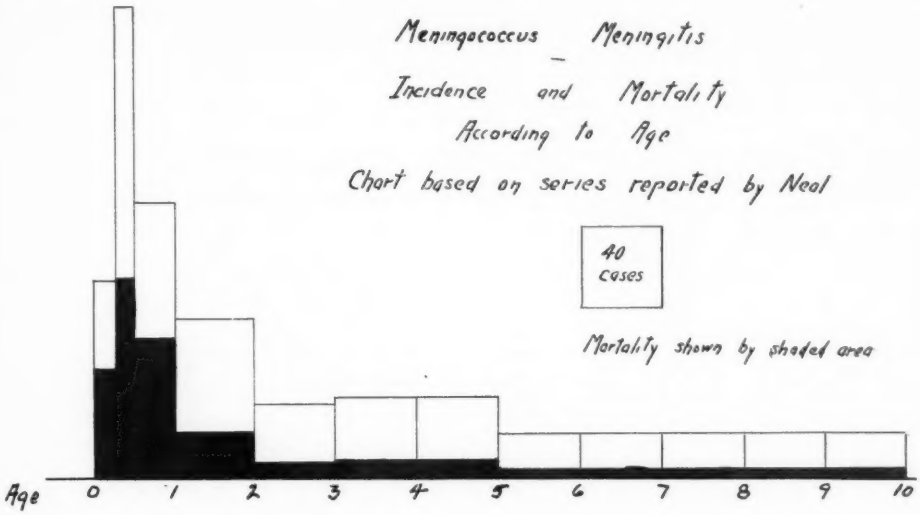


rum lacking in specific antibody activity. If anything, it is easier to administer serum to the infant than to the slightly older child. The dosage of serum which may be given with safety is essentially the same. Serum reactions are less frequent and less severe in the infant. Can this difference be explained on an anatomical basis? Can it be explained by assuming that the antibody producing mechanism has as yet not become active and the infant is inadequately equipped to combat any infection? Rather than concede too much to the assumed virulence of the infection and to the inadequacy of the defense mechanism of the infant, factors which we can little influence, might it not be profitable to consider the possibility of adding to our present methods of serum therapy?

Jochmann,[5] in 1906, reported the first successful use of intraspinous injections of antimeningococcus serum in human beings. Cushing and Sladen,[6] in 1908, reported the introduction of serum into the ventricles. Wegeforth, Ayer and Essick,[7] in 1919, performed cisternal puncture in man, and this was followed by the use of this route for the intrachecal administration of serum. Bennet,[8] Garrison[9] and others have reported favorably on the cisternal injection of serum. The combined injection of serum into the ventricles and into the spinal subarachnoid space, followed immediately with drainage from the cisterna magna, has also been employed with success.[10] Intravenous serum therapy as advocated by Herrick[11] in 1918 is to be considered as an adjunct to intrathecal therapy in those cases presenting a meningococcemia. Dye studies as introduced by Dandy and Blackfan[12] in 1914 have made possible the study of various obstructions occurring within the cerebrospinal system.

SERUM THERAPY

Success in the treatment of meningococcus meningitis depends upon the early recognition of the disease and upon the early and efficient administration of a specific antimeningococcus serum. The serum should be of high potency and must contain antibodies specific for the causative organism. The concentration of serum within the cerebrospinal system must be maintained as high as possible. The serum must be in intimate contact with the meningococci.

Might one approach this theoretically ideal condition by withdrawing the contaminated cerebrospinal fluid and replacing it with a serum of high potency? This would remove much of the infected fluid. It would provide a high concentration of serum which could be maintained for a relatively long period. An intimate contact of serum with cocci would be assured.

This possibility was suggested to me by Dr. E. A. Park and I attempted to do so by introducing serum into the ventricles while simultaneously withdrawing fluid from the spinal subarachnoid space. Five infants were treated as will be described.

METHOD OF SUBSTITUTION

(1) *Unilateral Ventricular Substitution.*—Two infants with bulging anterior fontanelles were treated essentially alike, in the following manner. The patient was placed on his left side and prepared for lumbar and ventricular puncture. One assistant held the patient as for lumbar puncture, and a second assistant held and protected the head. The right ventricle was entered with a new 19 or 20 gauge lumbar puncture needle. A few drops of purulent fluid were removed and the stylet replaced. Then a lumbar puncture was done with a new 18 gauge lumbar puncture needle. The stylet was removed, the patient's back was returned to its normal degree of extension and a 100 c. c. Luer syringe was attached to the needle by means of rubber tubing (length 20 cm.). Then, a serum reservoir consisting of the barrel of a 100 c. c. Luer syringe and containing 90 c. c. of antimeningococcus serum mixed with 1 c. c. of neutral phenolphthalein was attached to the needle to the ventricle by means of a rubber tubing (length 20 cm.). The weight of the dependent plunger combined with that of a column of serum at the ventricle, from 10 to 30 cm. high, provided the only pressure employed. After from 65 to 70 c. c. of purulent fluid had been withdrawn and about 55 c. c. of serum introduced, the dye appeared in the fluid from the lumbar puncture needle. Both syringes were then disconnected from their respective needles and the fluid from each allowed to flow until it dropped at the rate of from 20 to 30 drops per minute. This rate was considered an indication of normal pressure. Only about 0.5 c. c. of fluid escaped from the ventricular needle before pressure there was normal. Then the needle was withdrawn. In a short time the flow from the lumbar region indicated a return to normal pressure, approximately 2 c. c. having escaped before this occurred. The lumbar puncture needle was then withdrawn. The usual febrile reaction occurred. Small amounts of fluid were withdrawn from time to time for study and for the relief of pressure. Cultures and smears were made to determine when sterilization of the fluid occurred. Forty-eight hours following the first substitution, the procedure was repeated as before except that the patient was placed on his right side and the left ventricle tapped. Approximately 15 c. c. more of fluid was removed than was introduced. Following the second administration, spinal drainage was done with decreasing frequency and the progress in the spinal fluid characteristics noted.

(2) *Bilateral Ventricular Substitution.*—Because of the severe fulminating characteristics

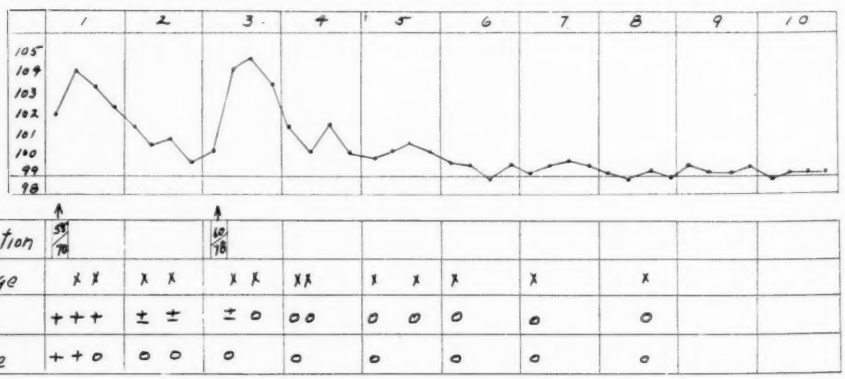
CASE I

Male 12 mos 2nd day of illness

Fontanelle bulging Sensorium clear Cervical rigidity

moderate severity, short duration, complete recovery

2 Substitutions (115 cc. Serum) 13 Spinal drainages



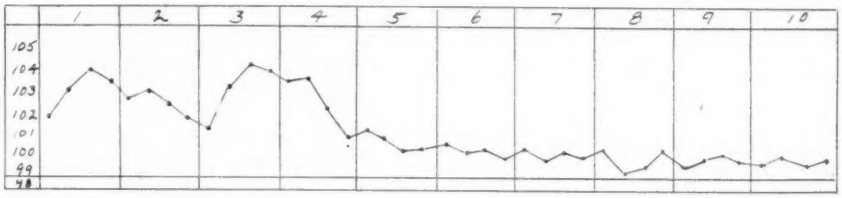
CASE II

Female 13 mos. 2nd day of illness

Fontanelle bulging, some petechiae, blood culture - 0

Moderate severity Sensorium clear Short duration

Complete recovery 2 Substitutions (140cc Serum) 14 drainages



Substitution	65/80			75/90						
Drainage	x x	x x x		x x	x x x	x	x		x		x
Smear	+ + +	+ ± o		o o o	o o o		o		o	•	o
Culture	+ + ±	o o o		o o o	o o o		o		o		o

CASE III

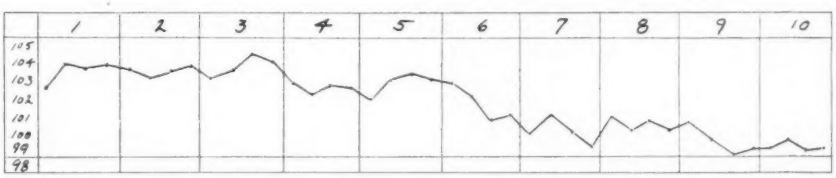
Male 10 mos. 4th day of illness

Fontanelle bulging & Tense Unconscious Prostration severe

Petechial rash fading, no cervical rigidity, very severe.

Consolidation right upper lobe, Complete recovery

2 Substitutions (Serum 176 cc.) 16 Spinal drainages

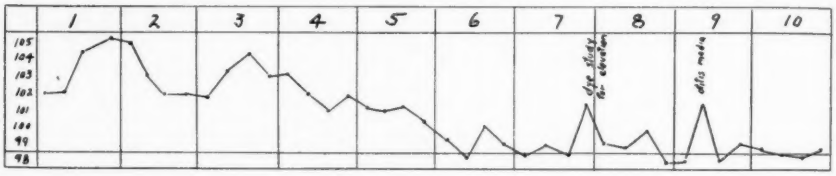


Substitution	70/90			100/120						
Drainage	x x x x	x	x	x x	x	x	x	x	x		x
Smear	+	+	+	+	± ± o	o	o	o	o		o
Culture	+	+	+	o	o o o	o	o	o	o		o

CASE IV

Male 8 mos. 2nd day of illness

Fontanelle tense & bulging, practically unconscious, petechiae, Prostration severe, little cervical rigidity, meningococcic otitis media on admission – Complete & early recovery 2 substitutions (140 cc serum) 13 Spinal drainages

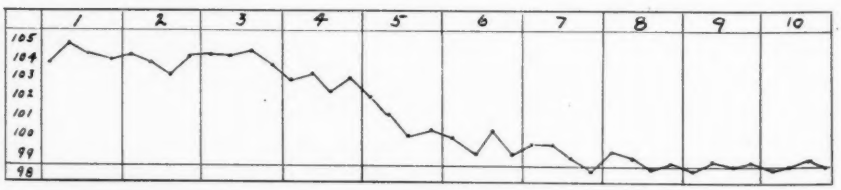


Substitution	65/80		75/85						
Drainage	x x	x x	x x	x x	x	x	x	x	x
Smear	+	+	o o	o	o	o	o	o	o
Culture	+	o	o o	o		o	o	o	o

CASE V

Female 14 mos. 3rd day of illness

Fontanelle tense & bulging - petechiae - moderate cervical rigidity - extreme prostration – practically unconscious - severe case & early & complete recovery - 2 substitutions (180 cc) - 12 Spinal drainages



Substitution	90/110		90/115						
Drainage	x x	x x	x x	x x	x	x	x	x	
Smear	+ + +	+ ±	o o	o	o	o	o	o	
Culture	+ + +	o o	o o	o	o	o	o	o	

presenting, three infants were treated in the following manner. With the patient on his back both ventricles were tapped, then the patient was carefully turned onto the left side and a lumbar puncture done. The serum reservoirs, consisting of two 50 c. c. Luer syringe barrels with rubber tubing, were attached, one to each needle. Then the syringe to the lumbar puncture needle was attached by means of similar tubing and the substitution completed. The column of serum at the ventricle and the column of serum at the lumbar region plus the weight of the dependent plunger provided the pressure for the substitution. Spinal drainage was done at intervals to relieve pressure and to enable the fluid to be studied. Forty-eight hours later the same procedure was repeated, followed by spinal drainage decreasing in frequency.

While my report deals primarily with the administration of serum to infants, I should like here to refer to another patient who was so treated.

He was a boy, aged 3½ years, who under the treatment usually carried out by repeated intraspinous administration of serum, developed a right ventricular blockage. Two trephine openings were made and the procedure carried out as described above. Thereafter, during a period of three weeks, we substituted serum for fluid repeatedly. He died subsequently because we were unable to obtain a serum that would free the spinal fluid from organisms, in spite of the fact that serums were obtained from five different commercial laboratories, two of which provided specially prepared serums after obtaining our cultures. His reactions to repeated treatment by substitution in no way differed from those that follow the administration of serum by simpler methods.

I refer to this case to show (1) that it is essential to have a potent and specific antiserum, and (2) that this method of substitution when carried out carefully was no more injurious to the patient than other methods, even when it was necessary to resort to it repeatedly, and (3) to cite the complications which may arise as a result of the repeated and prolonged use of serum intrathecally.

The patient just referred to presented various serum sensitization phenomena, including an Arthus phenomenon occurring in the choroid plexus. This has been observed before[13] and may happen as a result of repeated injections of serum intrathecally, no matter by what method the injection is carried out. At autopsy, each ventricle was almost completely filled with a mass closely resembling an organized blood clot, but which on further examination was found to be the choroid plexus swollen to many times its normal size, yet retaining its original contour and its normal attachments. This condition explained why we had experienced such difficulty in obtaining fluid from the ventricles the days just prior to his death. It also explained the obstruction to the right ventricle which had been present the day preceding his death. The structure as it passed through the foramen of Monro on the right was so swollen as to completely occlude the opening. I have not seen this described before as a cause of ventricular blockage or as a cause of "dry tap" of the ventricle.

There is another condition, seldom referred to in the literature, which is encountered in nearly every case where injections of serum into the cerebrospinal system have been carried out over any considerable length of time. In this, as a result of precipitation of protein and fibrin elements within the cerebrospinal fluid, there accumulates, especially in the spinal subarachnoid space, a thick "sediment," which does not pass readily through a needle. The thinner "supernatant" fluid is withdrawn repeatedly by spinal drainage and this process of "skimming" further adds to the solid content of the fluid with its attendant increase in tendency to blockage, adhesion formation and "dry tap."

Arguments in favor of terminating as quickly as possible the administration of serum are to be found in the observations above cited.

SUMMARY

In spite of the age of the infants treated, and the severity of their infections, an early and complete recovery occurred in each case. The duration of the illness was shortened. There were no sequelae.

A large initial dosage of serum combined with an extensive withdrawal of contaminated cerebrospinal fluid was obtained. The resulting concentration of serum was high and an intimate contact of serum with meningococci was provided. Early sterilization of the fluid occurred. In each case, two serum substitutions effected a clinical cure. Fewer injections of serum were required. In this manner it was possible to avoid many of the complications resulting from the repeated administration of serum intrathecally.

Neither the ventricular puncture nor the administration of serum by this method produced any untoward effects in the patients so treated. No vomiting, convulsions, cardiac or respiratory embarrassment occurred. There was no in-

creased depression nor aggravation of the clinical condition at any time.

The output of cerebrospinal fluid in response to serum injected seemed to be greater than that obtained by simpler methods of administration. This may be considered a favorable adjunct to therapy, as it provides excellent lavage of the cerebrospinal fluid spaces. Spinal drainage, frequently done, prevents difficulties from this standpoint. In the forty-eight hour period following the introduction of serum I withdrew as little fluid as possible in an attempt to maintain throughout that period a high concentration of serum.

The danger of exerting too much pressure within the cerebrospinal fluid chamber must be borne in mind. It is possible to carry out the procedure without exceeding the pressure found within the cerebrospinal fluid chamber under normal times.

The high infant mortality from meningococcus meningitis would seem to warrant attempts to use a procedure as radical as the one presented.

CONCLUSION

This method of substituting serum for cerebrospinal fluid is described with the realization that such a small series of cases cannot be more than suggestive of possible results. It has been successfully employed without at any time aggravating the clinical condition of the patient. The use of this method in infants with meningitis should result in a lowered mortality rate, a shortened duration of illness and a decreased incidence of sequelae.

While admittedly this is a radical procedure, in the hands of one who is careful the hazard is probably slight. Might not this hazard be accepted with the realization that even when our present methods of serum therapy are intelligently and intensively applied, from one-third to one-half of all infants with meningococcus meningitis may be expected to die?

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DISCUSSION (*Abstract*)

Dr. Gilbert J. Levy, Memphis, Tenn.—In our work with infants, the treatment routinely employed has been combined spinal, cisternal and intravenous with an occasional ventricular drainage and serum introduction. Our results have certainly not been encouraging. The infants treated in 1930 numbered 13 with 5 recoveries, a mortality of 61.5 per cent, 4 deaths occurring within twenty-four hours after admission. This year to November 1, we have had 5 cases with recovery, out of 10 treated, a mortality of 50 per cent. Two deaths in this series occurred within twenty-four hours after admission to the Isolation Hospital.

Dr. Lyon in his series, even though it is small, has demonstrated that large quantities of meningococcic serum may be substituted for cerebrospinal fluid, thereby giving us a high concentration of serum in intimate contact with meningococcic serum. Bacteriologists and clinicians engaged in treatment of epidemic meningitis have agreed that toxin neutralization and agglutination can best be gained by direct application of the serum to the inflammatory area. Again Dr. Lyon has proven that the fluids clear more rapidly of organisms and the cultures become negative more speedily.

It is our practice to inject suprarenalin chloride 1-1000 solution subcutaneously before the administration of serum irrespective of the type given. This anticipates to some extent thermal reactions or shock.

Let it be understood that ventricular punctures should not be attempted without practice upon the cadaver. This same reservation is made known to students and interns with reference to cisternal punctures.

I would and I feel sure that the audience would appreciate hearing from Dr. Lyon his technic for performing ventricular punctures.

On last Sunday, November 15, we had our first opportunity to make use of Dr. Lyon's method when an infant of nine months ill with meningococcic meningitis for one month was admitted to the Isolation Hospital. There had been two spinal drainages and serum replacements, on October 12, and October 14. The physical examination showed an intensely bulging fontanelle plus other pressure symptoms. Both ventricles were entered easily and a yellowish, cloudy fluid obtained. A lumbar puncture was next done. Two 50 c. c. Luer syringes each containing 25 c. c. of dyed serum and attached by rubber tubing to the ventricular needles allowed the serum to flow by gravity while an intern by gentle suction removed 55 c. c. of serum from the spinal needle. There was no increase in pressure flow after all syringes were disconnected. The laboratory reported all initial smears and cultures positive. Lumbar punctures were performed every six hours after the above procedure and the cultures obtained 36 hours afterwards were negative. This is too early to predict the ultimate result but we do feel

encouraged. Perhaps other dyes may be substituted for the phthalein solution should we accidently get subarachnoid hemorrhage which would discolor the fluid. Perhaps methylene blue might be substituted. The thought has occurred to me that in pneumococcus meningitis in cases under one year, this method of Dr. Lyon's might be used for introducing optochin hydrochloride 1-1000 solution. We have been fortunate this year to have three cases recover in older children. These three cases were treated intraspinally only.

Dr. Lyon (closing).—Dr. Levy has asked about the technic of ventricular puncture. There are different ways of doing this. I prefer to have the baby laid face up at the end of the table. It is most important that the baby be held very carefully by a capable assistant. While some prefer to introduce the needle through the fontanelle near the mid-line, I prefer to enter if possible 2 to 3 cm. lateral to the mid-line or in the lateral angle of the fontanelle. This avoids bleeding from trauma to the superior longitudinal sinus. The needle is then introduced inward along a plane which passes through the inner canthus of the eye on the corresponding side. Dr. Blackfan has stated that it is easier to do than a lumbar puncture. While this procedure is easily done it is not to be considered lightly. Although the brain seems to be able to withstand a considerable amount of punishment one should not abuse the privilege. On the other hand if ventricular puncture is indicated, one should not stand off just from awe of the brain structure. It is a valuable and safe procedure.

PRIMARY OSTEOMYELITIS (CHRONIC FIBROUS) OF THE ANTERIOR SUPERIOR SPINE OF THE ILIUM*

REPORT OF A CASE

By ROBERT CRAWFORD ROBERTSON, M.Sc., M.D.,
Chattanooga, Tenn.

While a small number of cases of acute pyogenic osteomyelitis of the ilium have been reported,[1 17] no recorded case of primary involvement of the anterior superior spine has been found.

Phemister[18 19] has studied 11 cases of chronic bone lesions which he considers probably infectious in origin. Clinical records of seven of these cases are given in which the duration of the symptoms varied from two months to two years prior to operation. Of these, seven were cultured at operation. On five, of which two are reported, the symptoms being of one and two years' duration, the cultures remained sterile. From two, of which one is reported, with symptoms of six months' duration, *Staphylococcus aureus* was obtained. The lesion, he feels, is a low grade pyogenic osteomyelitis. From a microscopic study of the excised tissue, in which fibroblasts predominate, he suggests the term chronic fibrous osteomyelitis.

The following case is considered worthy of report because of the apparent rarity of an infectious lesion of the anterior superior iliac spine; the uncertainty of preoperative diagnosis; and the apparently definite infectious origin of the lesion.

A. J., a white boy, a student, thirteen years of age, was first seen on December 8, 1927, in consultation with Dr. B. L. Jacobs. The patient complained of pain in the left hip. This pain began insidiously without known cause three weeks previously, and had grown progressively worse since the onset. It was dull and aching in nature, not referred, usually began in the early afternoon and continued until he retired. This symptom was markedly increased by weight bearing, and somewhat relieved by rest in the prone or sitting position. There was no known pyrexia prior to the previous day, when Dr. Jacobs found the temperature to be 100° by mouth. No history of trauma, recent infection or local hyperemia could be obtained. There had been no loss of weight. The appetite was good, the sleep undisturbed.

Past illnesses were erysipelas at three years, colitis at four, mumps at five, scarlet fever at six.

Tonsillectomy had been performed at seven years.

The paternal grandmother died of carcinoma of the stomach. A paternal aunt had undergone radical excision of the breast because of carcinoma, several years previously.

General examination revealed a well-developed and nourished boy who walked with limited motion in the left hip which was held in about 10 degrees flexion. The temperature was 98° by mouth. The length of the lower extremities was equal. There was no atrophy of the lower left extremity. There was slight visible enlargement in the region of the left anterior superior iliac spine. Palpation of this area revealed a firm, non-fluctant tumor mass, roughly ovoid in shape, measuring approximately 4.0x1.5x1.0 cm. involving the lateral aspect of the anterior superior spine and extending backwards along the crest. This mass was slightly tender to firm pressure. There was no hyperemia, local heat or inguinal adenopathy. The overlying soft tissues were not adherent. Passive hip motion was normal in range, but all limits of motion caused pain in the region of the tumor. The tonsils were cleanly removed. There was no injection of the throat or dental caries. There was no evidence of superficial infection of the skin. The remainder of the general examination was essentially negative.

Roentgenograms revealed a small area of destruction which involved the lateral aspect of the left anterior iliac spine. The density of the adjoining bone was moderately increased. The lungs, long, and remaining flat bones when x-rayed showed no evidence of pathology. Urinalysis was essentially negative. The blood findings were as follows:

Erythrocytes, 5,000,000
Hemoglobin, 75 per cent
Color Index, 0.7
Leucocytes, 13,400, of which there were
Polymorphonuclears, 80 per cent
Lymphocytes, 19 per cent
Mononuclears, 1 per cent
The blood Wassermann was negative.

*Read in Section on Bone and Joint Surgery, Southern Medical Association, Twenty-Fifth Annual Meeting, New Orleans, Louisiana, November 18-20, 1931.

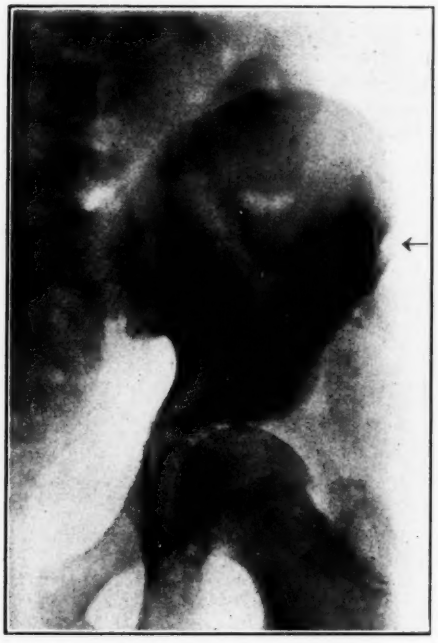

Fig. 1
Preoperative x-ray showing localized area of destruction (March 15, 1928).

A tentative diagnosis of primary malignancy, probably Ewing's sarcoma, was made and deep x ray therapy advised. From December 12 to 19, inclusive, four such treatments, totaling 48 milliampere minutes, using 150 kilovolts through 0.5 mm. of copper and 1.0 mm. of aluminum at 50 cm. distance was given over the region of the left iluim, by Dr. S. S. Marchbanks.

On December 17 the patient was entirely free from pain, and the limp had practically subsided. He remained free of symptoms and temperature e'evation, although the tumor increased slightly in size, until March 7, 1928, when the pa'n recurred and a temperature of 99.5° by mouth was recorded. On this date one of the parents recalled that the patient had complained of a few small, superficial postules in the left gluteal region about one week preceding the initial onset of the symptoms. These postules subsided without treatment after a few days time. Roentgenograms at this time revealed no apparent change in the tumor.

On March 16 the leucocyte count tota'ed 6,600, of which there were 66 per cent polymorphonuclears, 29 per cent lymphocytes, 1 per cent eosinophi's and 4 per cent transitionals.

An exploratory operation was advised, which was performed on the following day under ether anesthesia. The periosteum overlying the tumor was about twice normal thickness, and adherent to the underlying bone.

The anterior superior spine was approximately 2.0 cm. in thickness. The anterior portion of the crest

Fig. 2
Postoperative x-ray showing irregularity of ilium (October 22, 1929).

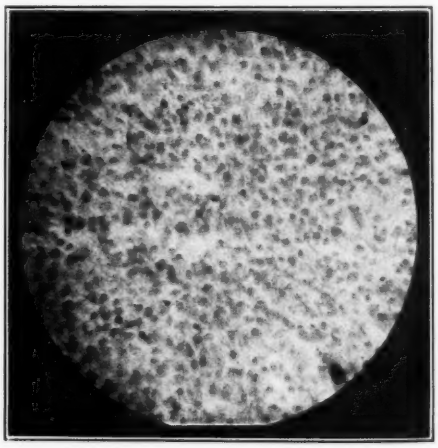

Fig. 3
Tissue removed at operation (oil immersion).

extending backwards from the spine was markedly thickened. The entire area of involvement was sclerotic. Upon removing the lateral portion of the tumor, three rounded, circumscribed areas of greyish co'ored soft tissue 0.3-0.5 cm. in diameter were found immediately beneath the lateral surface of the bone. Each of these areas appeared to be free of communication with the other. These areas together with the adjoining sclerotic bone were excised. No pus or sequestrum was seen. The field was swabbed with tr. iodine followed by alcohol and packed with vaseline gauze. It healed by granulation with moderate drainage, and was entirely closed on May 15.

From cultures made at the time of operation a pure strain of *Staphylococcus aureus* was recovered.

Microscopic study of the excised tissue was made by Dr. F. B. Bogart. This tissue consisted chief'y of fibroblasts with many polymorphonuclear leucocytes. There were numerous capillar'es, occasional areas of necrosis, and a definite marginal stroma of fibrous tissue.

The patient was last seen on October 22, 1929. There was no limp, pain or local pressure, or limitation of hip motion. The scar was adherent to the underlying ilium. Roentgenograms made on this date revealed no evidence of bone disease although the lateral aspect of the anterior spine was slightly irregular in outline.

It is felt that further study of this type of lesion will reveal its infectious or'gin, with sterilization in the chronic stage.

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DISCUSSION (*Abstract*)

Dr. William A. Boyd, Columbia, S. C.—I have endeavored to find other cases of acute infections of the anterior superior spine, but without success, and yet it is hard for me to believe that these cases are very rare. I wonder if it is because we consider them as acute osteomyelitis of the ilium, not of any particular portion of the ilium, and have not seen fit to report them. Even in the literature, cases of acute osteomyelitis of the ilium are not abundant.

A Russian reported before the Russian Surgical Congress, in 1925, 425 cases of acute osteomyelitis, 20 primarily osteomyelitis of the ilium. Of these 20 cases, 8 died.

In a recent issue of the *British Medical Journal*, Reynolds Short reports two cases of acute osteomyelitis of the ilium. In my own practice, I have had 6 cases of osteomye'itis of the ilium, one only, however, that could be considered acute when it came into our service.

Reynolds Short said there should be no difficulty in the diagnosis of acute osteomyelitis of the ilium; that with pain in the buttock, perhaps down the thigh and with a temperature and discomfort we should have no trouble in making the diagnosis, if we keep it in mind as a possibility. Yet in his two cases it was some seven, eight or nine days before his diagnosis was made.

Short says that in the treatment of cases of acute osteomyelitis, an incision should be made down to and through the periosteum; that an incision in the inner wall of the ilium should not be made, because of the possibility of setting up a pyemia. I can not agree with him. In all the cases I have had there has been a definite collection of pus between the inner wall of the ilium and the overlying fascia, so by simply incising the periosteum we are not going to do very much for our cases.

It has been my practice to make an incision down to the bone, then trephine the bone, so that good drainage is established, packing the wound lightly with sterile vaseline gauze. In one case I excised the diseased area, by a V shaped excision of the bone.

Dr. Custis Lee Hall, Washington, D. C.—Since receiving Dr. Robertson's paper, I have been unable to find any record of osteomyelitis of the anterior superior spine of the ilium. I have recently had a case of chronic fibrous osteomye'itis of the ilium of particular interest.

The infection was hemotogenous. The process was extremely rapid and within three months it had caused a large area of destruction in the wing of the left ilium.

Dr. Frederick C. Kidner, Detroit, Mich.—I have never seen a case of osteomyelitis of the anterior superior spine of the ilium, although many cases of the disease, in other portions of the pelvis, have come under my observation.

Osteomyelitis of any part of the ilium is difficult to diagnose and is very frequently missed because it is hard to recognize. The inflamed area is deeply buried by thick muscle and the pain incident to it is frequently referred to distant points.

Early recognition with prompt and thorough surgical intervention offer the best chance to avoid the frequently disastrous results of osteomye'itis of the ilium. In my experience, both in the Army and in private practice, when once established, osteomyelitis of the pelvic bones is a rather hopeless affair. Badgley's recently described operation for the complete removal of the

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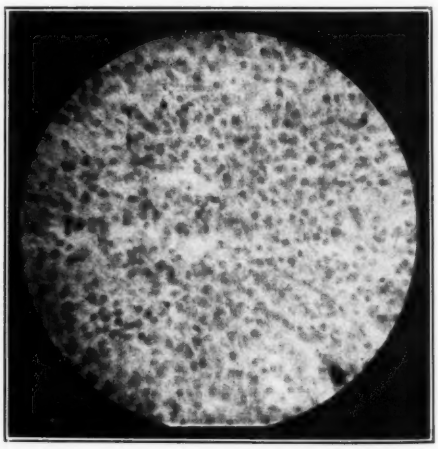

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Short says that in the treatment of cases of acute osteomyelitis, an incision should be made down to and through the periosteum; that an incision in the inner wall of the ilium should not be made, because of the possibility of setting up a pyemia. I can not agree with him. In all the cases I have had there has been a definite collection of pus between the inner wall of the ilium and the overlying fascia, so by simply incising the periosteum we are not going to do very much for our cases.

It has been my practice to make an incision down to the bone, then trephine the bone, so that good drainage is established, packing the wound lightly with sterile vaseline gauze. In one case I excised the diseased area, by a V shaped excision of the bone.

Dr. Custis Lee Hall, Washington, D. C.—Since receiving Dr. Robertson's paper, I have been unable to find any record of osteomyelitis of the anterior superior spine of the ilium. I have recently had a case of chronic fibrous osteomyelitis of the ilium of particular interest.

The infection was hemotogenous. The process was extremely rapid and within three months it had caused a large area of destruction in the wing of the left ilium.

Dr. Frederick C. Kidner, Detroit, Mich.—I have never seen a case of osteomyelitis of the anterior superior spine of the ilium, although many cases of the disease, in other portions of the pelvis, have come under my observation.

Osteomyelitis of any part of the ilium is difficult to diagnose and is very frequently missed because it is hard to recognize. The inflamed area is deeply buried by thick muscle and the pain incident to it is frequently referred to distant points.

Early recognition with prompt and thorough surgical intervention offer the best chance to avoid the frequently disastrous results of osteomyelitis of the ilium. In my experience, both in the Army and in private practice, when once established, osteomyelitis of the pelvic bones is a rather hopeless affair. Badgley's recently described operation for the complete removal of the

upper portion of the ilium down to the level of the hip joint, though extremely radical, probably offers the best chance.

Dr. J. W. White, Greenville, S. C.—Recognition of osteomyelitis may be difficult, particularly if there is no local tenderness. I recently diagnosed a case of osteomyelitis of the ilium as an acute abdominal condition, and sent the child away from the orthopedic hospital to which it had been sent for my examination.

Dr. Robertson (closing).—In my practice I have seen no acute case of osteomyelitis of the ilium. I have seen several chronic cases with involvement of the ilium and other pelvic bones.

In my hands treatment has been unsatisfactory and prolonged.

This case was of particular interest to me, because of the fact that the boy had no temperature when first seen. The temperature did not exceed normal, until immediately prior to operation and then registered only 99.5° by mouth. It was then that we wakened to the fact that it was probably an infectious lesion.

The family history of malignancy and his response to x-ray had been, in our opinion, strong circumstantial evidence of the probable existence of a malignancy. In retrospection, it is easy to see that the diagnosis should have been made earlier.

This type is apparently the lowest grade of bone infection. Reported cases emphasize the fact that sequestration and pus formation do not occur.

ROENTGENOGRAPHIC PELVIMETRY*

PERFECTED TECHNIC WITH THE USE OF NEW APPARATUS

By J. Bay Jacobs, M.D., F.A.C.S.,
Washington, D. C.

Two years ago I had the honor of presenting before this Association an instrument which I had devised and designated as the obstetric inclinometer.[1] At that time, with the aid of lantern slides, the application of the inclinometer was demonstrated, as well as the method of calculating accurately the length of the true conjugate diameter and the inclination of the various pelvic planes. The construction of a pelvigram was shown to be a simple procedure. This could be filed with patient's chart or used for determining the inclination of the inlet.

The obstetrician is concerned particularly with borderline, contracted and distorted pelves. All of the antero-posterior diameters of the true pelvis may be measured or calculated with the inclinometer; also the inclination of any plane may be noted. By roentgenographic pelvimetry it is possible to measure all of the diameters of the inlet and also observe the contour. This is an aid to the understanding of the mechanism and management of labor in patients with abnormal pelves.

As the x-rays leave the target of the tube they diverge equally from the center ray, which is directed perpendicularly to the surface exposed. Should the film be placed parallel to this surface, the amount of distortion will be uniform in all directions.

The perforated lead plate devised by Thoms[2] is an excellent means for measuring distortion. Previously there had been no practical way of determining the exact inclination of the inlet, and so it has been almost impossible to obtain accuracy in reproducing the brim of the pelvis. As will be subsequently shown, a discrepancy of only 5 degrees in the estimation of inclination of the pelvis will produce an error of over 0.5 cm. in the length of the conjugata vera.

METHOD OF PROCEDURE

As explained in previous articles,[1,3] the height and inclination of the symphysis and then the length and inclination of the diagonal conjugate are noted.

In almost all cases when the woman is in the recumbent or lithotomy position, the sacral promontory is at a lower level than the lower border of the symphysis (*Fig. 1*). Therefore, the sum of the angles of inclination of the symphysis and diagonal conjugate is equal to the obstetric angle. Two sides and the included (obstetric) angle of the triangle being known, the third side (true conjugate) may be determined with the aid of the calculator embodied in the inclinometer. The triangle produced with the calculator is an exact reduplication of the interior of the pelvis as composed of the symphysis, conjugata diagonalis and conjugata vera.

The inclination of the plane of the inlet is found in either of two ways. First a pelvigram (*Fig. 1*) may be drawn; and here it may be well to refer briefly to the manner of its construction. At any point on a horizontal line are laid off, with the aid of an ordinary protractor, lines denoting the length and inclinations of the symphysis and diagonal conjugate. The true conjugate is then drawn between the top of the symphysis and the distal end of the diagonal conjugate. The angle between the true conjugate and the horizontal line is the inclination of the pelvis and is measured with the protractor. Secondly, according to elementary geo-

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*From the Department of Obstetrics, Georgetown University School of Medicine, Washington, D. C.

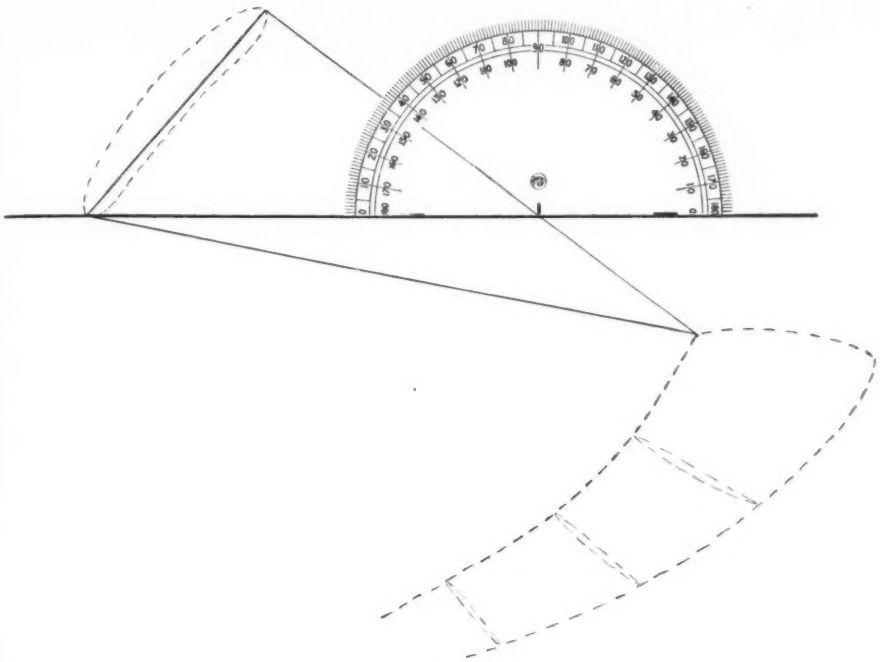

Fig. 1
Pelvigram. Protractor measures inclination of inlet, or angle that inlet makes with horizon. The "obstetric angle" is included between the symphysis and diagonal conjugate.

metric rules (*Fig. 2*), the inclination of the inlet is equal to the angle (c) of inclination of the diagonal conjugate plus the angle (b) between the true and diagonal conjugates. As shown in *Fig. 2*, the author uses a paper protractor to measure angle b.

In this particular technic of roentgenographic pelvimetry, it is necessary that the patient lie on a radio-transparent table. The cassette containing the film must be placed at a station below the buttocks and exactly parallel to the inlet. For this purpose the author has devised

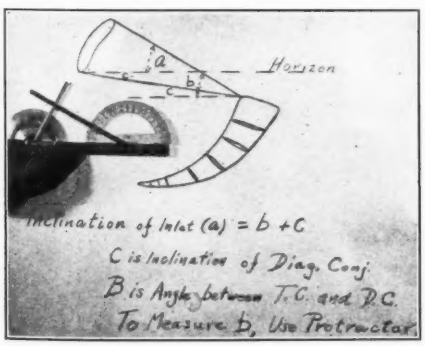

Fig. 2
Determining the inclination of the inlet without the use of a pelvigram.

Fig. 3
Film is parallel to inlet and x-ray tube is set at same angle, so that center ray is perpendicular to the middle of the inlet. Distortion will then be uniform.

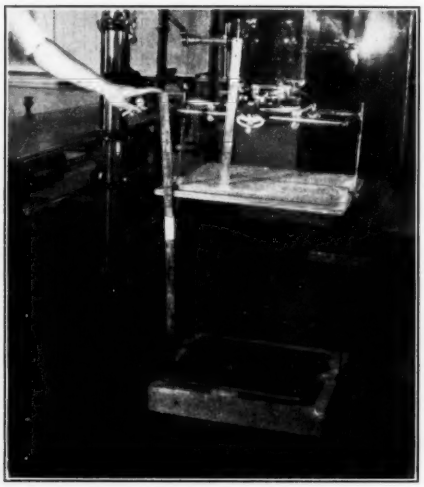

Fig. 4

After exposure is made, film is placed as shown. The perforated lead plate is parallel to film, and the distance from film to lead plate equals inlet to film distance. Distance from target to lead plate is same as target to inlet. The indicator on x-ray tube reads O°. A second exposure (flash exposure) is made, before film is developed.

a tilt-top table (*Fig. 3*) with a telescopic leg; underneath the top is a small handle which, when manipulated, allows adjustment to any angle, as denoted by the indicator on the face of the protractor.

The indicator on the frame supporting the x-ray tube is set at the same angle as the pelvic inlet and film (*Fig. 3*), so that the center x-ray will be directed perpendicularly through these two planes. The tube is then placed a short distance above and approximately over the center of the inlet. This is best accomplished by placing beneath the tube an aluminum disc with pinhole perforation through its center, then darkening the room momentarily and lighting the filament. The beam of light reflected from target through pinhole is directed over the approximate center of the superior strait (about 5 cm. behind the pubis).

Distance from target to upper border of symphysis (inlet) is measured; also distance from inlet to film. Exposure is made.

The patient may now leave the table. The film is placed on the base of the stand that supports the thin lead plate which was first used by Thoms (*Fig. 4*). Its distance from the film is the same as the inlet to film distance. The x-ray tube is adjusted over the lead plate, so that its center ray is perpendicular and the distance from target to lead plate is equal to that of target to inlet. A flash exposure is made (second exposure) and the film developed. Any diameter of the inlet can be read in centimeters by merely counting the dots (*Fig 5*).

STUDY OF THE BONY PELVIS

The method was first applied to the bony pelvis. By assembling the inclinometer and holding it in the plane of the true conjugate, the displacement of the pendulum recorded the inclination of that plane. The film was supported

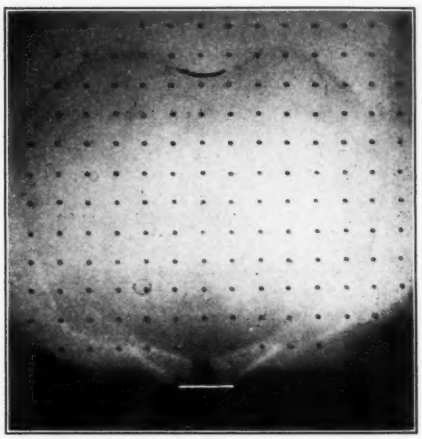

Fig. 5

The true conjugate and transverse diameters are measured by counting the dots. White line indicates middle of upper border of symphysis.

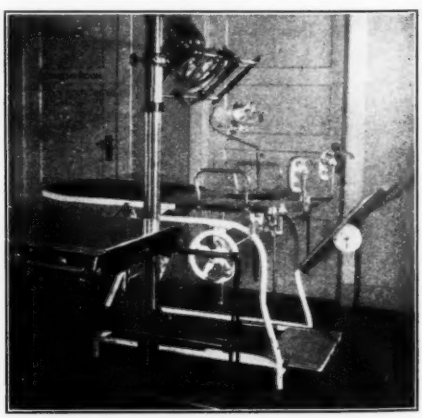

Fig. 6

The bony pelvis is substituted for the patient, showing relationship of tube to inlet and film.

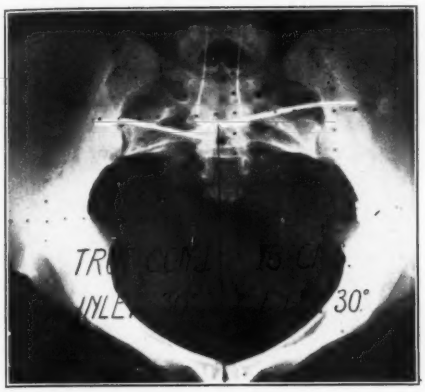

Fig. 7

Roentgenogram of bony pelvis. A lead strip was fastened to the sacral promontory and another to the middle of upper border of symphysis, so that the location of these landmarks on film would be definitely established.

below and parallel to the inlet of the pelvis, which was resting upon a radiotransparent table (*Fig. 6*). The rest of the technic was carried out as previously described. The diameters of the superior strait, as projected upon the film, were compared with the actual measurements of the inlet and found to be identical (*Fig. 7*).

To obtain accuracy, one must know the correct inclination of the pelvis. The inclination of the plane of the external conjugate is no reliable indication of pelvic inclination. It is almost impossible for the true and external conjugates to lie in the same plane, and of course one cannot by any maneuver so arrange them.

The upper border of the symphysis is definite indication of the anterior boundary of the plane of the inlet. Likewise, the promontory of the sacrum is the posterior boundary of this plane. By no means of external palpation can one locate the promontory of the sacrum. When one presumes that a certain landmark on the patient's back, located through movable, loosely attached overlying skin, lies in the plane of the true conjugate, the image on the film is not the outline of the inlet equally distorted in all directions, but it is the equally distorted outline of the presumable plane of the inlet, or what may be called the unequally distorted image of the inlet. Although by the method of Thoms the distortion is correctly measured, it appears that it would be impossible to determine with absolute precision the length of the true conjugate, because the exact inclination of the inlet is unknown.

It may be shown mathematically and by actual practice with the bony pelvis that some error must exist when determining the length of the true conjugate by roentgenographic pelvimetry, should the exact inclination of the pelvis (inlet) be unknown. Thus it is found that for each 5 degrees of discrepancy between the angulation or inclination of the plane of the superior strait and film the resultant error in determining the length of the true conjugate is at least 0.5 cm. (*Fig. 8*). Also depending upon the degree of error, the asymmetrical contour of the inlet of a pelvis that is only slightly deformed may appear normal, due to unequal distortion in the image.

SUMMARY

(1) A new simple method of determining the inclination of the pelvis without the use of a pelvigram is described.

(2) A model of a radiotransparent table for roentgenographic pelvimetry is presented. The patient is measured in the position she usually assumes during delivery. This is necessary, because pelvic inclination and the length of the true conjugate vary as the thighs are flexed or extended on the abdomen.

(3) An ideal tilt-top table for use in this work is demonstrated.

(4) An aluminum disc with pinhole perforation in the center is introduced. This facilitates centering of the x-ray tube.

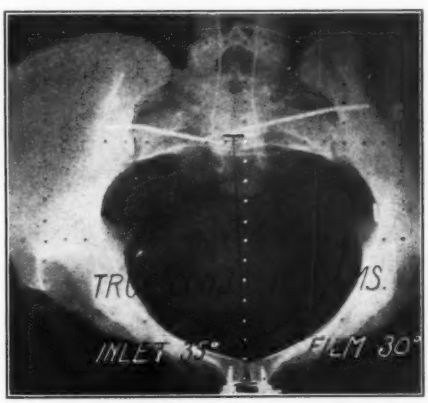

Fig. 8

True conjugate measures 12.5 cms. instead of 13, because of 5° discrepancy between inlet and film.

(5) This technic of roentgenographic pelvimetry is practical and accurate.

(6) Often a pelvis with a peculiar or deformed inlet which by other means of study would be overlooked, may be detected.

(7) Transverse contraction of the inlet may be detected.

(8) The inclinometer has demonstrated its utility because its calculations correspond to roentgenographic observations and direct mensuration of the inlet when the abdomen is opened.

(9) The true and external conjugates do not lie in the same plane. To eliminate error, one must know the inclination of the plane of the inlet.

(10) The length of the true conjugate may approach, or even equal, the diagonal conjugate. This depends principally upon the size of the obstetric angle and the height of the symphysis.

(11) In patients who present short interspinous or intercristal measurements, borderline or deformed pelves, the importance of observing the contour and diameters of the inlet is stressed.

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Chastleton Hotel

DISCUSSION (*Abstract*)

Dr. M. Pierce Rucker, Richmond, Va.—I do not know about this last addition to Dr. Jacobs' technic, but after the Asheville meeting I undertook to play with his apparatus. It offers a very good way of recording on your history diagrammatically what you believe is the condition in the pelvis. My only objection to the apparatus is that I have not been able to use it very satisfactorily or comfortably in primiparae. After delivery when we want to find out why we had trouble it makes a very good apparatus for that purpose.

I have been much impressed with Dr. Jacobs' technic in taking films of the superior straight and think it is much more sensible than any plan that has been devised so far. It is a much more comfortable position for the patient than the semi-reclining position.

Dr. R. S. MacCabe, Oklahoma City, Okla.—After having made measurements of the pelvis by your method, have you checked those against the figures obtained by external pelvimetry? If so, what relation do they bear?

Dr. J. R. Reinberger, Memphis, Tenn.—Some time after the work of Dr. Thoms of Yale was published, Dr. Schreier interested our service in x-ray pelvimetry during pregnancy and labor. Dr. Pullian, the roentgenologist, spent a great deal of time in estimating the size of normal and abnormal pelves with flat x-ray plates by Thoms' method. Failure in this study to give the desired information as to whether or not the head would enter the pelvis suggested the possibility of noting the actual descent of the presenting part during labor. It was found that to be of value serial sagittal pictures, showing engagement and descent would have to be taken to conform with the actual test of labor in hours in borderline pelves. We demonstrated that this procedure was a valuable adjunct in conjunction with the always necessary pelvic examination in determining whether or not the labor should be terminated artificially and if so the procedure of choice to pursue. It must not be forgotten that the estimation requires a trained roentgenologist in this field. It is unwise to trust the average man. Moreover, many disasters have resulted from accepting his advice as to whether or not the presenting part would enter the inlet, after the simple flat picture. Therefore, only in institutions doing this work daily can a possible source of help come. To date the fetal head continues to be the best pelvimeter.

Dr. Schreier and I reported our preliminary series of x-ray plates taken during the course of labor and demonstrated its possibilities. We hope to report at a future date a larger group with more definite plans formulated as to the management of borderline pelves by x-ray.

Dr. Jacobs' excellent photographic presentation makes one feel that a more refined technic is being worked upon and that in time it may be possible to give a better prognosis as to the outcome of labor. I feel at present that it only demonstrates, and this very beautifully, the more marked abnormal pelves that are encountered. It may be advantageous for us to combine Dr. Jacobs' procedure with our present serial sagittal plates and by doing this we may lower our present rate of morbidity and mortality, particularly fetal and sometimes maternal.

Dr. Jacobs (closing.)—When one is gentle in applying the inclinometer, the patient does not complain. After carefully separating the labia minora, the perineum should be depressed and the lubricated rod is readily introduced and its tip carried to the sacral promontory. If it is possible to reach the promontory with the examining fingers, the pelvis may be studied with the inclinometer. Of course we are most interested in primiparae, for we know nothing of their ability to deliver babies.

The question was asked concerning the relative value of external and internal pelvimetry. The external measurements serve admirably for classifying a pelvis. When any of these diameters are contracted, it is advisable to determine the internal ones. When Baudelocque's diameter is shortened, the true conjugate may or may not be ample, depending to a great extent upon the thickness of bone and overlying tissues. Transverse contraction of the inlet may be suspected when the interspinous and the intercristal diameters are contracted; but one must remember that the flare of the iliac bones, upward and outward from the brim,

varies in all women. A patient may have an ample transverse diameter of the inlet, even though the external transverse diameters are shortened. These women must be measured by roentgenographic pelvimetry, for that is the only way to determine the length of the transverse diameter of the inlet?

Sagittal pictures as suggested by Dr. Reinberger, should appeal to us in certain cases, for the technic is simple, you may get an accurate idea of the length of the conjugata vera, and an unsuspected lumbar lordosis, common in colored women, may manifest itself.

The following point should be emphasized:

A picture taken of the external conjugate does not give an accurate idea of the length of the true conjugate, for these two diameters do not lie in the same plane.

There is a difference between equal and unequal distortion. When the technic is not accurate, an asymmetrical inlet may be so affected by unequal distortion, as to appear symmetrical. I have in my possession a Naegele type pelvis which, when the patient was alive, was reported as normal in contour, by the roentgenologist, who used the ordinary technic. With the aid of the inclinometer this pelvis had been accurately described during the patient's life.

Also it is interesting to note the measurements of the fetal skull in all operative deliveries and all cases of non-macerated stillbirth. In my opinion a case is not completely studied unless this information is recorded, so that a comparison may be made between the size of the skull and the maternal pelvis. This would be of great help in a study of fetal and maternal mortality and morbidity.

THE PERSIMMON BEZOAR*

WITH REPORT OF A CASE

By VICTOR E. SCHULZE, M.D.,
Galveston, Tex.

A perusal of the available literature fails to confirm the opinion of Rivers and Davison[1] that the persimmon is the most frequent source of gastric bezoars in the United States. The number of cases reported, however, is no criterion of the incidence of this condition, since many cases are not reported;[2] and many more are perhaps not recognized because the entity is not universally appreciated.

The purpose of this paper is to direct attention to the persimmon bezoar as another possible cause of chronic gastric complaints in residents of the southern part of the United States where the persimmon is indigenous, and to emphasize the characteristic, singular syndrome produced by the persimmon bezoar as an aid in its apprehension when a cause for the symptoms presented.

Outten[3] of St. Louis (1894) appears to have been the first to demonstrate and report the persimmon as a source of foreign bodies in the stomach of man, although it is very probable that the condition of "persimmon seed ball" was suspected for many years prior to the publication of Outten's paper. The literature contains reports of only 17 other cases of persimmon bezoars. These include the cases reported by Peple,[4] six by Hart,[5] Upson,[6] Porter and McKinney,[7] Larimore,[8] David,[9] Maes,[10] Garrett,[11] Balfour and Good,[12] Droegemueller,[13] Camp,[14] and Pollok.[15] Another case is added in this report.

The bezoars are generally irregularly spherical and usually of dark brown or black color. The average size is 5 by 6 cm.; the weight varies from 32 grams[15] to 396.8 grams[5] in the reported cases. The internal structure is heterogeneous, consisting of irregularly placed cellulose fibers, skins and seeds in an amorphous matrix. Only twice were multiple bezoars reported.[3 13]

Etiology.—The circumstances under which the persimmons were eaten appear to play a large role in the formation of these foreign bodies of the stomach as indicated by the histories of the reported instances. The majority of the individuals were engaged in sports, such as jaunting, hunting, and golfing, and were exceedingly hungry at the time that the persimmons were eaten; they ate the persimmons in haste and in the absence of other food or drink.

The process involved is speculative. A theory attributing their formation to the cohesive property of the contained pectins and gums is untenable in view of the facts that persimmon bezoars differ from other phytobezoars in that they show no lamination and central nuclei, that they rarely reveal incorporation of material foreign to the persimmon, and that the bezoars are formed shortly after the persimmons are eaten. The facts at hand permit a plausible correlation, however. Gastric analysis data, available in only nine of the reported cases, disclose a tendency to hyperacidity in six and normal acidity in the remaining three. The persimmons were eaten in the absence of other food, during hunger, when the gastric acid response was most apt to be maximal and completely available to the persimmons ingested. The persimmon has a pectin and gum content (14.1 per cent)[16] greater than that of any other common fruit. The jellying property of pectin is enhanced in the presence of acid.[17] Thus the high gastric

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acid response favors the "precipitation" of the pectins and gums which, during their solidification, incorporate the fibers, skins and seeds in the formation of the persimmon bezoar. With the gastric acidity impeding the further action of ptyalin, and the solidification of the polysaccharids in the stomach prohibiting their access to the amylase of the intestine, hydrolysis of the pectin and gum is largely prevented.

Symptomatology.—Within four to twenty-four hours following the ingestion of the persimmons, symptoms of an acute gastrointestinal disturbance are manifested. These symptoms include anorexia, nausea, vomiting, diarrhea, general malaise, headache and fever. These continue for two to three days, and upon their subsidence symptoms of a chronic digestive disturbance make their appearance and persist until the bezoar is removed. These later symptoms are varied and bizarre and may include almost any conceivable expression of disturbed gastrointestinal physiology. They may perfidiously mimic any of the recognized gastroenteric syndromes. Anorexia and nausea of periodic occurrence during the day or night are the most common and prominent symptoms. Though the nausea may be extreme, few are able to vomit. A sense of weight in the epigastrium, postcibal fullness and discomfort, and variable pain are frequently complained of. Some experience food relief while in others ingestion of food appears to aggravate the symptoms. Changes from the usual number and consistency of bowel movements are inconstant. In only 4 of the 18 reported cases was the persimmon mass said to be palpable.

Diagnosis.—Persimmon bezoars have been confused with splenectopia, calculous cholecystitis, carcinoma of the stomach, peptic ulcer, and benign and polypoid tumors of the stomach. The condition was diagnosed preoperatively in only 6 of the 19 cases, including the case of the appended report. The discovery of a palpable mass in the epigastrium of an adult resident of the South complaining of persistent digestive disturbances warrants a consideration of persimmon bezoar before the prognosis can be fully evaluated.

The elicitation of the following triad in the history of a patient complaining of chronic gastroenteric symptoms should predicate the diagnosis of persimmon bezoar: (1) ingestion of persimmons, particularly in the absence of other food and especially when hungry, (2) followed within twenty-four hours by an acute gastrointestinal disturbance, upon the subsidence of which, after a few days, (3) persistent symptoms, usually of periodic daily occurrence, referable to a chronic gastric disturbance, make their appearance.

The diagnosis is confirmed roentgenologically by the finding of a non-opaque mass, mobile from cardia to pylorus, which divides and displaces the stream of barium mixture as it enters the stomach and does not interfere with the progression and completion of peristalsis.

Complications.—Gastric ulcers were associated with persimmon bezoars in 7 of the 19 cases. In 2 of these 7, the previous histories indicated that the ulcers antedated the occurrence of the bezoars. Persimmon bezoar caused obstruction once.[5]

Treatment.—The physical nature of these bezoars and their frequent association with the perforating type of ulcer remove from consideration other methods of treatment at one time considered optional with surgical removal.

A consideration anent prevention is pertinent. The circumstances under which the majority of persimmon bezoars have occurred should be avoided. Eaten slowly with other foods and masticated well, the persimmon should be innocuous.

CASE REPORT

C. N., a white man, 52 years of age, tailor and resident of Galveston, entered the John Sealy Hospital on January 24, 1931, complaining of stomach trouble, the chief symptoms of which were extreme anorexia and periodic nausea. He stated that his trouble began three months prior to his admission to the hospital when, while on a jaunt over a farm in East Texas, he ate a dozen small ripe persimmons in place of his customary noonday meal. Four hours later, he became acutely ill with nausea, fever, and general malaise which confined him to bed for two days. His present symptoms began upon the subsidence of the acute disturbance. Anorexia was extreme; all food was repulsive. Nausea, the most annoying symptom by far, was relieved temporarily by the taking of food. The type and amount of food determined the degree of relief obtained; solid foods caused severe cramping pain for one or two hours after their ingestion followed by a return of the nausea. He preferred a liquid diet of which he took small amounts at frequent intervals. All attempts to vomit had been futile. Soda relieved neither the nausea nor the pain. The feces had been scybalous since the beginning of his present illness. He had lost 31 pounds in the three months of his illness.

The past history was inconsequential. A brother had died of pulmonary tuberculosis, and a sister had died of uterine cancer.

The patient was well developed but appreciably undernourished and, although pale, he did not appear cachectic. He was edentulous and habitually masticated his food poorly and ate hurriedly. The remainder of the physical examination was essentially negative except the blood pressure of 100 mm. systolic and 56

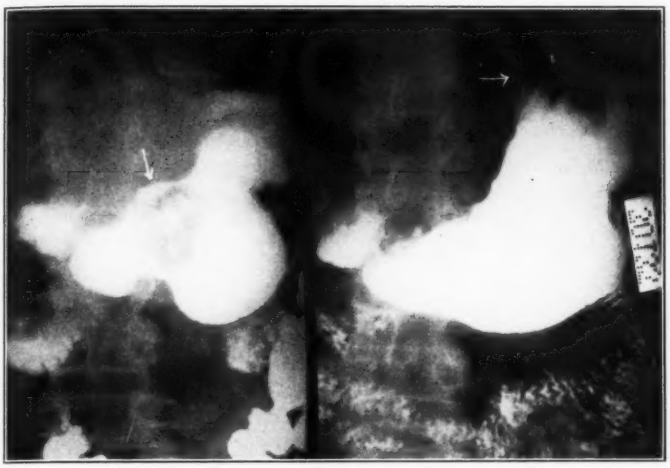

Fig. 1
Radiograms showing free mobility of the non-opaque foreign body in the stomach.

mm. diastolic in both arms, and the elicitation of moderate tenderness on deep palpation in the mid epigastrium. No mass was felt.

Examination of the blood disclosed a moderate secondary anemia and a negative Wassermann reaction. The urine was normal. Gastric analysis performed on 70 c. c. of stomach content, removed one hour after a Chron-Boas meal, revealed free acidity equivalent to 75 c. c., and a total acidity equivalent to 96 c. c. of decinormal sodium hydroxide. The benzidine test on an acidified ether extract of the stomach contents gave results indicative of the presence of blood. A persimmon bezoar was suspected and the patient studied radioscopically. There was found after the oral administration of barium mixture, inside the lumen of the stomach, an oval filling defect of irregular outline about 2½ inches in diameter, which could be moved from fundus to pylorus. The stomach was of normal shape and contour, and peristalsis was uninterrupted. In the pyloric end of the stomach there was visualized on the lesser curvature near the pylorus a tiny deformity suggestive of a peptic ulcer.

The patient was referred to the department of surgery for exploration with a preoperative diagnosis of persimmon bezoar with an acute gastric ulcer. Abdominal exploration was performed by A. O. Singleton on February 4, 1931. A black, doughy, roughly spherical, unattached tumor mass, 4 by 5½ cm., was found in the stomach. The mass weighed 92 grams and on section showed a heterogeneous interior of light yellow-brown color, in which could be identified three seeds and numerous skin fragments resembling those of the persimmon. The sectioned mass emitted the odor of fermenting fruit. Further exploration of the stomach revealed a sub-acute ulcer with crater 1 cm. in diameter on the lesser curvature near the pylorus. The postoperative convalescence was uneventful and recovery complete. The patient was discharged from the hospital on February 28, 1931.

Fig. 2
Persimmon bezoar seen from an end with a part broken off to show the internal structure.

SUMMARY

(1) Attention is directed to the persimmon bezoar as a possible, sufficiently common cause for chronic gastric complaints in residents of the southern part of the United States to warrant its consideration in the differential diagnosis of such symptoms.

(2) The syndrome produced by the persimmon bezoar is emphasized as an aid in the apprehension of this cause for chronic gastric complaints.

(3) A plausible theory of explanation for the formation of persimmon bezoars is advanced.

(4) The literature is reviewed.

(5) A case is reported.

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GRANULOMA INGUINALE*

WITH SPECIAL REFERENCE TO ITS OCCURRENCE IN THE WHITE RACE

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This disease condition occurs fairly frequently among negroes and to a much less extent in members of the white race. Most text-books give scant space to the subject of granuloma inguinale, and some make no mention of it at all. Specialists in venereal diseases are familiar with this condition, but the average practitioner is not cognizant of its frequency and its salient features. Therefore, I wish to present a general survey of this subject.

HISTORY AND INCIDENCE

Only a few of the outstanding contributors to the subject are mentioned herein and they but briefly. Granuloma inguinale was described by Conyers and Daniels[2] in British Guiana in 1896, although Daniels[1] thinks that the condition was previously described by McLeod, Mait'and, and others in India. In 1912, Aragao and Vianna[3] did much work in Rio de Janeiro along this line. Grindon described the condition in America and Ricono[5] in South America, in 1916. In 1905, Donovan[6] in India described the organisms now called the Donovan bodies which he found constantly in the lesions. Randa'l, Small, and Belk[7] reported a series in Philadelphia in 1921. Reed and Wolf,[8] Gage,[9] and Johns and Gage,[10] were pioneers in the diagnosis and treatment of this disease among negroes in New Orleans, and consequently throughout the South. In 1924, Johns and Gage[10] published the results of clinical and laboratory research based on a large number of cases seen in negroes. At that time these workers stated that though they had at some former period met with two cases among Caucasians presenting the typical clinical picture of the disease, yet they had never seen the Donovan bodies demonstrated in the lesions of members of the white race.

Parounagian and Goodman,[11] in 1922, reported a case in a white man who was born in New York. Fox[12] in an article in the Journal of the American Medical Association in 1926, found the disease present in 135 Negroes and 15 Caucasians. McIntosh,[13] in 1930, stated that he had not seen the disease in the white race. However, Goodman[20] in a recent article states that he has seen as many cases in whites as in negroes, though these case reports were not illustrated.

Age and Sex Incidence.—Both sexes are affected, the proportion not being as yet established. I have seen no case in the female of the white race. Granuloma occurs from about puberty on, though more frequently in the age of the greatest sexual activity.

Transmission and Incubation Period.—The consensus of opinion is that the disease is transmitted by means of sexual contact. However, there are many instances known where one of the co-habitants has not contracted the infection, which probably indicates a low degree of infectiousness. The incubation period is not known. The estimates range from 2 to 40 days.

Etiology.—Most authorities accept the Donovan body as the causative agent and this can hardly be disputed, since these organisms are constant in the lesions. Various secondary organisms may be found in the lesions, especially the Bacillus mucosus-capsulatus and saprophytic spirochetes. It is not known whether the organism is bacterial or protozoal in character. Much cultural work has been done, and many attempts have been made to fulfill Koch's postulates, but without complete success. The papers of Johns and Gage,[10] Gage,[14] McIntosh[15] and DeMonbreun and Goodpasture[16] may be consulted on this phase. The late H. Noguchi came to New Orleans to study the cultural problem, but without success. A little later, about 1929, I had the opportunity of studying organisms grown in pure culture by Gage, in New Orleans, which were indistinguishable morphologically and tinctorially from those seen in direct tissue smears.

Pathological and Clinical Features.—Granuloma inguinale is a chronic disease lasting for many years and as a rule does not at first seriously affect the general health. The usual sites of the lesions are the external genitalia, groin, perineum, anus, thighs, and buttocks, though any region of the body may be affected. Cases have been reported in which the nose, mouth, neck and upper portions of the body were in-

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volved, without genital lesions being present. In the male the penis, including the prepuce, is the most frequent initial site, and the labia in the female.

The lesions are most characteristic, and once seen are not likely to be forgotten. The process begins as a macule, then a papule, which gradually increases in size and breaks through the epidermis to appear as a distinctly elevated granuloma which is pink to red in color. The lesion may become somewhat ulcerated in the center with rolled or heaped up borders, elevated as much as 1 cm. The base of the lesion or shallow ulceration is greyish to red and presents granulation tissue which bleeds on the slightest touch. The lesions extend and involve adjacent areas by continuity or contact until often there is extensive involvement of the genitals, groin, thighs, and anal region. In a fully developed case, the lesions are oval areas ranging from 2 to 10 or 20 cm. in diameter.

Secondary infection and edema, especially of the penis and scrotum, often play a large part in the disease and may require the amputation of the external genitalia. However, in neglected or stubborn cases, the disease process itself may so involve the external genitalia as to cause stricture or spontaneous amputation. Spontaneous healing does not occur. Under medication, healing is by scar formation, and relapse or reactivation is frequent. The scars are not pigmented. Abscess or sinus formation does not occur and lymph nodes are not usually involved.

Differential Diagnosis.—To those not very familiar with the disease, mistakes in diagnosis may be caused by the lesions of syphilis, tuberculosis cutis, chancroid, mycosis and malignancy. Also a combination of granuloma with any of these lesions may occur. Especially is granuloma likely to be confused with a chancroidal lesion until the process has gained much headway. It is well known that carcinoma of the genitalia develops upon a basis of chronic infection and irritation. In the case of a negro woman a number of pathologists, including myself, discovered independently the Donovan bodies in a bilateral infection of the labia, and about a year later my fellow pathologist, Dr. W. F. Thomas, diagnosed in the same case a typical carcinoma of the same area by biopsy.

Treatment and Prognosis.—Aragao and Vianna, in 1912, are credited with the use of tartar emetic in this disease. The usual plan is to administer the drug intravenously in from 5 to 12 c. c. of a 1 per cent solution, at intervals of 2 to 3 days, until the disease is overcome. However, Gage and Johns[10] recommend intermittent courses rather than continued treatment, as the drug is cumulative and toxic, and the liver is likely to be damaged. After long periods of treatment patients frequently complain of severe pain in the arm, shoulder or other joints. Gage and Johns[10] mention the death of three patients in New Orleans who had received up to 18 c. c. per injection. Randall believes the tri-amide of thioglycollate to be a superior compound for this condition. In addition numerous local antiseptics, including tartar emetic, ultraviolet rays and actual cautery, have been used with varied success. Relapses are common and treatment must be prolonged and repeated. At best the treatment leaves much to be desired. Excellent articles on the subject by Reith[18] and by Bland[19] may be read with profit.

CASES IN THE WHITE RACE

Case 1.—(Studied through the courtesy of Drs. H. B. Pedigo and Rogers Pierson). A white man, aged 28, was admitted to the Beaumont General Hospital for a

Fig. 1
Granuloma inguinale lesions in young white male. Moderately advanced.

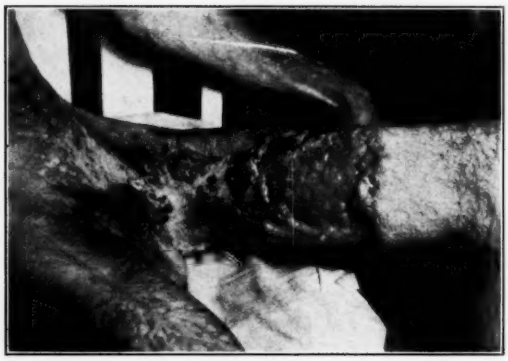

Fig. 2
Granuloma inguinale lesions in young white male. Extensive lesions of far advanced case. Note loss of penis.

continuation of treatment, which had been discontinued for some time. The patient presented large typical lesions of the pubic, inguinal, and anal regions (*Fig. 1*). Smears made from the margin of a lesion and stained with Wright's, showed a few Donovan bodies. Cauterization, dyes, ultraviolet rays, and tartar emetic were used. This patient tolerated the latter drug poorly, perhaps due to the fact that he has familial hemolytic jaundice, as shown by a huge spleen, increased fragility of erythrocytes, and the other characteristic blood findings. At the present time he is somewhat improved.

Fig. 3
Rear view of same patient shown in preceding picture.

Case 2.—(Studied through the courtesy of Dr. John Gardner). A white man, age about 45 years, had a lesion of the prepuce at the margin that resembled a typical chancre. The dark field was negative as were the Wassermann and precipitin reactions. Scrapings were made and stained with Wright's and Gram's and numerous Donovan bodies were seen within and without the large mononuclear cells. (Donovan bodies are gram-negative intracellular'y.) The patient slowly improved under tartar emetic, and his lesions have healed without spreading. He refused to be photographed.

Case 3.—(Patient of Drs. W. A. Smith, T. A. Fears, and S. T. Wier). This patient was treated at Hotel Dieu, Beaumont, for several years and is an advanced case. His lesions involve the pubic, inguinal, and anal regions, and a large portion of the thighs (*Figs. 2 and 3*) It was necessary to amputate the penis due to massive involvement with stricture. Smears show the Donovan bodies.

Fig. 4 shows a photomicrograph of the Donovan bodies in smears made from *Case 2*, the patient who refused to be photographed. As a matter of record, I obtained the confirmation of Drs. Johns and Gage concerning the diagnosis of these slides. These patients appear to be pure Caucasians and denied having had intercourse with members of the negro race.

Fig. 4
Photomicrograph of smear from granuloma inguinale lesion, showing a large mononuclear cell filled with Donovan bodies and some extracellular bodies. (Wright's stain.) (Oil imm.).

Technic of Demonstrating Donovan Bodies.—I have found smears made from the lesions to be superior to tissue sections. If the latter are to be made the tissue may be fixed in Giemsa's fluid or formalin and potassium dichromate as recommended by McIntosh, and stained with hematoxylin-eosin, Wright's or Giemsa's. Thin smears obtained from several areas or lesions are stained for about 15 to 20 minutes with Wright's. The bodies are relatively large oval structures, best seen in the large mononuclears, with or without capsules, and with a central rod or chromatin body. If there is difficulty in locating the organisms, this may be overcome by spreading cedar oil over the smear and using the low dry lens to locate cells laden with the Donovan bodies, which are then studied under the oil immersion. However, a little practice is required before one may use the low dry lens with advantage.

SUMMARY

(1) A general resume of granuloma inguinale is presented.

(2) Its frequency among negroes is well known.

(3) The disease is not so rare in the white race as has been thought.

(4) Early diagnosis and persistent treatment is necessary for results at all favorable.

(5) The writer presents records with illustrations of 3 cases in white males.

(6) The treatment is often unsatisfactory and the prognosis not very favorable.

(7) Tartar emetic is the nearest to a specific of any drug used in this disease.

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DISCUSSION (*Abstract*)

Dr. I. M. Gage, New Orleans, La.—It is frequently stated that this disease is rare in the white race and is almost entirely limited to the black race. Schochet was one of the first to tabulate the incidence of granuloma inguinale in the white and colored races. He reported in 1914 five cases in the white race, which occurred in the United States and its dependencies. Later Fox, of New York, reported the comparative incidence of blacks to whites as 9 to 1. Ross, in 1927, reported 13 cases occurring in the white race. I have gone over the reports of his cases and believe that there is some discrepancy between his clinical and bacteriological evidence.

I believe that we will find the recorded ratio between blacks and whites is lower than 9 to 1. The probable reason for the failure to recognize the disease is that, as a whole, we are too prone to call all lesions of the external genitals either luetic or chancroid without depending on a bacteriological examination for diagnosis in all our cases. The only way in which this can be corrected is to demand a thorough bacteriological study of all lesions occurring on the external genitals. When the diagnosis is based on the bacteriological findings, there will be more cases reported occurring in both whites and blacks.

The etiology of granuloma inguinale is still a debatable question. The constant presence of the Donovan body in the lesion of granuloma inguinale and its demonstration in the lesions of granuloma inguinale throughout the world certainly suggest a close relationship between the Donovan body and the disease. There may or may not be a symbiosis with some other organism

as yet not demonstrated in the lesions that may play an important part in the production of the disease. However, the Donovan body, if not the primary etiological factor, takes the leading role in the production of the disease.

Two years ago I cultured an organism that had all the morphological and staining characteristics that are portrayed by the Donovan body. This organism was cuitured on Sabouraud's medium, and the colony made its appearance within thirty-six hours as a fine, white colony with stellate radiations. The organism was a non-motile, gram-positive aerobe.

Inoculation of laboratory animals and two humans with this organism has given negative results. They differed from the organisms grown by other workers in this field in that the organism when injected into the experimental animals and humans did not at any time produce an abscess. However, after inoculation there appeared a nodule in the first few days, which reached its maximum enlargement about the twenty-first day after which it gradually subsided. An organism similar in every way to the one injected into an animal was recovered on the seventeenth day after inoculation from one of the nodules. The production of a typical lesion of granuloma inguinale has proved disappointing.

The clinical symptoms of the disease have been described by Dr. Lewis. However, I should like to state that the lesions of granuloma inguinale present rather bizarre clinical manifestations at times, which are misleading, and a diagnosis can be made only by those who have had wide clinical experience. Therefore, a positive diagnosis of granuloma inguinale should be made only on demonstration of the Donovan body in smears made from the lesion, which have been stained by Wright's stain.

The treatment of this disease is very simple and gives excellent results only when the disease is recognized early and the specific treatment instituted before the lesions become chronic. The use of tartar emetic intravenously is a specific for granuloma inguinale provided that it is given when the earliest clinical manifestations of the disease are recognized. Theirfielder has reported excellent results when the drug was given early in the course of the disease, whereas in the late cases the results were very discouraging and disappointing, there being frequent recurrences.

In the late cases (they always present marked productive fibrosis beneath the granulations) we believe in, and have advised the use of surgery. The lesions should be thoroughly cauterized while the patient is under a general anesthetic. This cauterization should always be preceded by tartar emetic medication for a period of at least two weeks and then for a period of months after recovery from the operation.

The diagnosis of squamous cell carcinoma in sections removed from lesions of granuloma inguina'e should be made with reservations. I have seen two cases diagnosed as carcinoma of the inguinal region recover under tartar emetic medication without any evidence of malignancy. This mistake was due to the presence of cell nests of squamous cells which one sometimes will see in sections removed from the ulcerated area. This is due to the proliferation and the prolongation downward of the papillae of the skin into the tela subcutanea.

To summarize, always think of granuloma inguinale when a patient presents a lesion of the external genitalia. Make at least fifteen smears from the lesion and stain them with Wright's stain, and then search carefully for the Donovan body. Make your diagnosis early and institute treatment before the lesion becomes chronic. In this way the majority of cases will be cured and recurrences will be negligible.

Dr. J. A. McIntosh, Memphis, Tenn.—We have seen a number of cases of granuloma inguinale, perhaps 50, in negroes and only one in the white. Recently a patient came to the laboratory with a penile lesion, chancre-like, closely resembling the lesion of syphilis. In the stained smear we demonstrated Donovan bodies.

This patient received nine 5 c. c. doses of 1 per cent tartar emetic, and has recovered.

Systemic manifestations of granuloma inguinale occur because there is a change in the blood globulins. This change in the globulins can be elicited with the formol jell test. If positive the serum jells and you have in the test tube a jelly clot that does not shrink. We have observed this in every case of granuloma inguinale.

Dr. Ernest W. Goodpasture, Nashville, Tenn.—During the past three years at the Vanderbilt Hospital we have been interested in the study of granuloma inguinale, and we have seen about 10 cases definitely proved by smears. All of these 10 cases have been in the negro race until this past September, when we encountered a single case in a white woman 65 years of age. This patient gave a history of having had erosions about the vulva for about six months. She is living in very degraded conditions. This is the only case that we have encountered thus far in a white person.

Dr. Lewis (closing).—Some of us have been loath to accept cases in the white race until we, ourselves, have identified the Donovan bodies. I have just recollected that Dr. J. A. Lanford made the diagnosis for me of granuloma inguinale in a white man, when I was still a technician and medical student in New Orleans.

Of course, any condition that ulcerates becomes secondarily infected, and anything that confines a patient to bed, will be accompanied by a good deal of debility and slow decline in health.

The case of the negro woman, referred to in my paper, who developed carcinoma of the vulva following an unyielding granuloma inguinale infection, is pathologically speaking a unique one. There is, to my knowledge, no such occurrence mentioned in the literature, though we know carcinoma of the vulva usually develops on a basis of such chronic conditions as syphilis, tuberculosis, mycosis, or pruritis.

I am sorry not to have anything to offer in the way of more efficient treatment of this condition. I am pessimistic about the therapeusis of this rather horrible disease, and for that reason wish to emphasize the necessity for early diagnosis.

MALIGNANT TUMORS OF THE MALE BREAST*

PRELIMINARY AND ABBREVIATED REPORT

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Roger Williams,[1] in 1892, recorded the statements:

"Throughout the body malignant neoplasms occur with greater relative frequency than non-malignant ones. I have found the ratio to be 64 per cent of the former to 36 per cent of the latter. In the breast the relative preponderance of malignant neoplasms is still greater, for as the table shows, 81.7 per cent of all its neoplasms are of this nature, and only 18.3 per cent are non-malignant. . . . The influence of sex in the development of neoplasms is very great. In general, females are about twice as liable as males, the percentage proportion, according to my estimate, being 67 females to 33 males. In the breast, however, nearly 99 per cent of all its neoplasms occur in females, and only about 1 per cent in males."

The impressions of Williams are still mirrored in articles appearing in medical literature of today. The study upon which this report is made was begun in 1924 with the belief that valuable information would come from such a critical histologic and statistical study, based upon strictly pathologic material coming to a small and limited number of pathologists having an extensive diagnostic service. One of the purposes has been to determine, so far as possible, the facts concerning the types and numbers of non-neoplastic diseases, benign tumors, and malignant tumors, and their relative ratios as seen in the male breast.

Source, Type and Amount of Material.—This study of 60 malignant tumors of the male breast represents a total of such tumors encountered in 117,016 surgical tissue specimens examined in the diagnostic laboratory of the State Institute for the Study of Malignant Disease, Buffalo, New York, and in the laboratory of the Department of Pathology of the University of Missouri. Of the grand total number of specimens, 9,279 were of the breast; of this number, 308 were from men, and 8,941 from women, while the sex was not ascertained for 30 specimens.

Acknowledgment and thanks are made to Dr. Burton T. Simpson, Director of the State Institute for the Study of Malignant Disease, Buffalo, New York, for the unique privilege of using the material and records of that institution. While most of the specimens were from there, 406 breasts and 10,433 total specimens were from my own laboratory, and of material sent direct to me by conferring physicians for diagnosis.

The material studied represents specimens of breasts submitted by surgeons distributed over the states of New York and Missouri to one of the laboratories for diagnosis. It, therefore, represents types of lesions, their ratio, and statistical facts as encountered by pathologic diagnostic services representing two sections of this country. It is to be emphasized that the tissues handled in each of these two laboratories are from various surgeons and hospitals distributed over the two separate states. The material then may be considered as representative of the population at large, and not from a select clientele who patronize one or more specialists. The final classification and grouping of the 308 male breast lesions have been done by the author to obtain the opinion and unified terminology of a single observer (*Table 1*).

Classification of Lesions and Incidence of Types.—Of the 308 male breasts examined, 60, or 19.48 per cent, contained malignant neoplasms; 50, or 16.23 per cent, were carcinomas, and 10, or 3.25 per cent, were sarcomas (*Table 2*). It was found that 105, or 34.09 per cent

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*A more extensive and detail report will appear in *Archives of Surgery*.

†Professor of Pathology, University of Missouri School of Medicine.

Table 1

GROUP DIAGNOSES, PERCENTAGES AND RATIOS

Group Diagnoses	Total		Male		Female		Ratio Male to Female
	Number	Per Cent	Number	Per Cent	Number	Per Cent	
Containing malignant tumors	4125	44.45	60	0.64	4065	43.80	1:67.75
Containing benign tumors	2429	26.17	105	1.13	2324	25.04	1:22.13
Seat of cysts, mastitis, etc. Not containing tumors	2551	27.49	140	1.50	2411	25.99	1:17.22
Necrosis, decomposed, unfixed, etc. No diagnosis possible	144	1.55	3	0.031	141	1.519	1:47.00
Where sex was not ascertained	30	0.32					
Total breasts examined	9279	99.98	308	3.31	8941	96.33	1:29.03

of the male breasts, contained benign tumors, while 143, or 46.42 per cent of them, contained lesions other than neoplastic growths. The new growths, benign and malignant combined, were 165, or only 53.63 per cent of the sum total of 308 cases. Of the 165 new growths, the 60 malignant cases represented 36.36 per cent, with there being 50, or 30.3 per cent carcinomas, and 10, or 6.06 per cent, sarcomas.

The incidence of carcinoma of the male breast as compared to that of the female was 50 to 4,014, or a proportion of 1 to 80, or 1.24 per cent of the breast carcinomas in this group occurred in the male. The incidence of sarcoma of the male breast as compared to that of the female was 10 to 51, or a proportion of 1 to 5.1; or 19.61 per cent of the breast sarcomas in this group occurred in the male.

Carcinomas in the male breast numbered 50, whereas there were 10 sarcomas. Carcinomas, therefore, occurred only 5 times more often in the male breast than sarcomas. In the female breast there were 4,014 carcinomas as contrasted to only 51 sarcomas. Carcinomas were then 79 times more common in the female breast than sarcomas. As compared with the number of carcinomas in the breast of the two sexes, sarcomas occurred proportionately almost 16 times more often in the male breast than in that of the female.

CARCINOMAS

Herein are recorded 60 malignant neoplasms. Of these, 50 were carcinomas, and of this number 42 were of gland (acinus) or duct cell type, and 8 were of skin origin (*Table 2*).

The youngest patient in this group of male breast carcinomas was 30 years of age at the time when the tumor was removed, and the oldest was 89, while the average for the group was 57.7 years. Only 29.8 per cent of the cases developed prior to the fifty-first year of age, while 85.1 per cent were found in individuals over 41 years of age, and 17 per cent after the seventy-first year. The average age for the development of sarcoma was found to be 39.7 years, hence the sarcomas as a group began at an average of 18 years earlier in life than did the carcinomas. The factor of age and its significance is here well exemplified. The time that elapsed from the first knowledge the patient had of his tumor until operation averaged 15 months, with 4 years being the longest and 3 to 4 weeks as the shortest period of time recorded.

Table 2

HISTO-PATHOLOGIC TYPES AS FOUND IN SIXTY CASES OF MALIGNANT TUMORS OF THE MALE BREAST

	No. Cases	Per Cent of Total	Group Per Cent of Total
A. Sarcoma			
Chondro-myxosarcoma	1	1.66	
Fibrosarcoma (small spindle cell)	5	8.33	
Leiomyosarcoma (large spindle cell)	1	1.66	
Liposarcoma	1	1.66	
Lymphosarcoma	1	1.66	
Myeloma (myeloid sarcoma)	1	1.66	
Total sarcomata	10	16.66	16.66
B. Carcinoma			
1. *Skin Type*			
Basal cell carcinoma	2	3.33	
Melano carcinoma	1	1.66	
Nevus cell carcinoma	3	5.00	
Squamous cell carcinoma (epithelioma)	2	3.33	
Total skin carcinomata	8	13.33	
2. *Duct or gland cell carcinoma*			
Duct cell carcinoma	9	15.00	
Adenocarcinoma	3	5.00	
Colloid carcinoma	1	1.66	
Medullary carcinoma	15	25.00	
Scirrhous carcinoma	9	15.00	
Carcinoma simplex	5	8.33	
Total duct or gland cell carcinoma	42	70.00	
Total carcinomata	50	83.33	83.33
Total cases	60	99.99	99.99

While it is generally stated in the literature that trauma plays an important role in the causation of many of the tumors of the male breast, it was found in this group that in only 4 instances was there such a history. In these cases, however, its relationship appears significant.

Skin involvement, as shown by ulceration of that covering the tumor, was seen in 3 instances upon inspection of the specimen at the laboratory. Gross muscle invasion was found in one breast, and histologic preparations revealed muscles invaded by cancer cells in 7 other cases. This observation was made upon the routine diagnostic sections, and not as the result of a planned systematic search for such local extension.

Metastases were present at the time of operation in 16 of the 50 cases of male breast carcinoma. In 13 instances, histologic sections of the axillary lymph nodes (of the side as the involved breast) revealed metastases. In several of these the areas of involvement were gross and general inspection would have sufficed. At death, autopsy on 3 of the 13 revealed metastatic involvements of the lungs, liver, axillary lymph nodes and skin. Only skin nodules of the neighboring area could be found in one patient, but

at death there was a generalized visceral carcinomatosis. Two patients had skin nodules over the thorax and another had involvement of the group of lymph nodes behind the pectoral muscles. Two patients who had no axillary node involvement at operation (gross and histologic search) had at death some months later generalized visceral metastases. The basal cell type carcinomas showed at time of their primary removal neither muscle involvement nor metastases in the axillary lymph nodes or elsewhere.

Considering all factors whereby the degree of malignancy is estimated, it seemed advisable to record such in only 3 degrees. Following this course, there were found 14 cases of high degree, 25 of moderate degree, and 11 of a low grade malignancy. Among those rated as high grade malignancy occurs the melano carcinoma and one of the epitheliomas. The group of low grade types contains the basal cell and colloid carcinomas. Contrary to the general belief that carcinomas of the male breast are most often of the scirrhous type and of low grade malignancy, these cases as a group showed a rather high grade of malignancy.

SARCOMAS

Of the 60 neoplasms herein recorded, 10 were sarcomas. A case of myeloma is included under the head of sarcoma, with 5 cases of fibrosarcoma and 1 case each of leiomyosarcoma, liposarcoma, lymphosarcoma and chondro-myxosarcoma (*Table 2*).

The youngest patient in this group was 25 years of age; the oldest, the one having the myeloma, was 62, while the average age for those having sarcoma of the breast was 39.7 years. It is to be especially noted that there were 3 patients having the age of 62, 59 and 54 when the tumor developed. The period of time that elapsed from the first knowledge the patient had of his tumor until operation averaged 21 months for the 4 on whom this information was obtained. The periods given were 1 year, 14 months, 2 years, and 3 years.

In only one instance was there given a history of trauma to the breast in which the sarcoma was present. In this case, the injury was 14 years prior to the time the tumor was noted.

Ulceration of the covering skin was not seen in any case. Gross muscle involvement was present in only one instance, and here there was invasion of the pectorals with fixation to the chest wall. Routine histologic examination for diagnosis revealed muscle invasion in 2 instances. If sections had been chosen for a systematic study of such invasion, it is probable that other instances would have been found. In 7 of the cases there was no information relative to metastasis or involvement of other tissues or organs. Several months after the tumor and breast had been removed, one patient had lung metastases. In the case of the myeloma it was stated that the fourth rib on the corresponding side showed an apparent growth (which possibly was the primary tumor), and that the patient died presumably as the result of metastasis to the spine.

Based upon histologic findings, embryonic cell appearances, lack of cell differentiation, mitotic cells, hyperchromatic nuclei, peripheral invasive character, vascularity and thinness of vessel walls, this group of sarcomas was evaluated as to the degree of their malignancy. Those having a high degree of malignancy were 2 of the fibrosarcomas, the liposarcoma, the lymphosarcoma, and the myeloma. The other 5 were graded as of moderate degree malignancy.

GENERAL FACTORS

The pathologic variations between the malignancies of the male and female breasts are those of degree and ratio of types, and not in kind. Those of the male breast are indistinguishable from the similar tumors more often seen in the female breast. The conspicuous differences noted were (1) the higher per cent of benign tumors than is recorded for the female breast; (2) the much less frequency of cysts; and (3) the much higher incidence of sarcomas in the breasts of men than in those of women, as compared with the sex proportion of carcinomas of that organ. Because of the size and configuration of the male breast and its lack of physiologic function, lesions of it should be noted much earlier than in the female. This probably is the reason for the high percentage of non-neoplastic and non-malignant lesions found in the breasts herein recorded. The changes in size, shape and function, and the development of lumps are easily and probably early found by the patient. The medical profession looks upon lumps and nodules in the male breast as being almost entirely always malignant, or at least potentially so, and advise re-

moval at once. They then are seen early and removed before time and opportunity have been supplied for malignant changes to develop, as we believe they do, in a high percentage of the benign lesions of the female breast.

SUMMARY AND CONCLUSIONS

(1) Of the 9,279 breasts examined, 308, or 3.31 per cent, were from the male sex, or a ratio of 1 male to 29.03 female breasts.

(2) Of the 308 male breast lesions studied:

(a) Contrary to the general belief,[1 2 3] carcinomas were found not to be the most frequent lesion of that organ. They were found only 50 times, or in 16.23 per cent of the cases.

(b) Sarcomas were found not to be the second most frequent lesion as is commonly stated.[4] There were only 10 instances of sarcoma, or 3.25 per cent.

(c) There were 105 cases, or 34.09 per cent, of benign tumors.

(d) In 143 of the breasts, or 46.42 per cent, there were lesions other than of neoplastic character.

These facts are significant, and indicate that of the male breast diseases only 53.63 per cent were tumors, and that of the tumors, only 36.36 per cent were malignant in character.

(3) Of the 60 instances of malignant tumors, 50, or 83.33 per cent, were carcinomas, and 10, or 16.66 per cent, were sarcomas.

(4) Carcinomas of the male breast accounted for 1.24 per cent of the breast carcinomas.

(5) Of the sarcomas of the breast in both sexes, 19.61 per cent were in the male breast.

(6) Carcinomas were 80 times proportionately more frequent in the female breast than in the male.

(7) Sarcomas were 16 times proportionately more prevalent in the male breast than in the female.

(8) Carcinoma occurred in the male breast only 5 times more frequently than did sarcoma, whereas in the female breast carcinoma was seen 79 times more often than was sarcoma.

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CONGENITAL SYPHILIS*

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It is a by-word among all students of medicine that the manifestations of syphilis are protean, and that its treatment is as difficult and complicated as its symptomatology is diversified.

In recent years our therapeutic armament against this disease has been greatly strengthened, and at present we feel more competent to cope with its inroads and encroachments upon the boundaries of our physical well-being than did our ancient brethren whose desperate attempts to defend themselves against it depended largely upon their skillful manipulations of mercury and guaiac.

We have learned much since those days, and particularly since Schaudinn, in 1905, demonstrated the *Treponema pallidum* to be the causative agent of syphilis; and five years later Ehrlich evolved the arsenicals which at present constitute our sheet anchor in combating the ravages of this disease.

Despite the great advances we have made in recent years in the diagnosis of syphilis, it still presents many phases that are confused by diversified opinions and inadequate knowledge. Of these there is none more complicated than that of congenital syphilis.

It has long been thought by most of us that the Biblical reference to the sins of the father being visited upon the third and fourth generation referred to syphilis, and yet up to the present no satisfactory evidence has been produced to show that this disease existed in the Near East two thousand years ago, and we know in spite of the fact that it is at present in the vanguard of the causes of infant mortality, yet the second generation seems to offer an adequate atonement for the sins of the first, and rarely are members of later generations sacrificed to it as innocent victims.

It is with this second generation that I am particularly concerned, and although the last twenty years have witnessed a gratifying decrease of the incidence of congenital syphilis, yet there are still many problems related to it that await a final answer.

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At present, most congenital syphilitics belong to those classes which for economic reasons must be treated in the clinics; and during my association for the past two years with such a clinic at the Louisville City Hospital I have often found myself faced with questions for which I had no satisfactory solution.

THE FOLLOW-UP PROBLEM

On preliminary examination it appeared that this clinic offered abundant material for evaluating the success of diagnosis and the result of treatment. Closer investigation, however, showed that during the last five years at least 210 congenital syphilitics had been registered in that department, but that most of them, after wholly inadequate treatment, had ceased coming and were subsequently lost track of. Repeated efforts were made at intervals to reach these patients through letters, but for the most part this follow-up effort was wasted.

Again, during the past six months, letters were sent urging them to report for further examination and treatment, but less than 5 per cent of these letters effected the return of the patient. In most instances their address had been changed and it was impossible to trace them. Personal follow-up of a few more recent cases was far more effective. Although the State Board of Health expends considerable money and energy in this service, it is impossible to maintain contact with all clinic patients through letters exclusively.

As Stokes[1] and his co-workers showed in a recent paper, personal follow-up work is twice as effective as, but four times more expensive than, that conducted through the medium of correspondence alone. It is, therefore, beyond the reach of the average clinic today. In this respect ours is no exception.

The number of patients that I was able to work up satisfactorily was small, therefore, compared to the number I had hoped for, but they can at least serve as illustrations for the problems which I am to bring to your attention.

DIAGNOSIS OF SYPHILIS DURING PREGNANCY

Fifty-one women, either pregnant or recently delivered, were examined. All of them had shown a four-plus blood Wassermann on one or more occasions. Ten were able very definitely to date the onset of their infection, the duration of which averaged in this group six and one-half years. The other 41, or roughly 80 per cent, denied all primary and secondary symptoms and had no idea when infection occurred. This percentage is the same as Cannon[2] found in his study of 202 congenital syphilitics, while Halloran[3] reported that of 225 pregnant women with strongly positive blood Wassermann reactions, 134 gave histories of abortions without ever having recognized the primary or secondary infection.

This common observation has been explained by the fact that pregnancy acts as a partial cure for syphilis, particularly in those instances where the date of infection approximately coincides with that of conception and many times the primary and secondary manifestations of the disease remain completely masked during pregnancy.

This phenomenon has been substantiated experimentally by the much cited work of Brown and Pearce[4] on rabbits. They found that when pregnant and lactating females were inoculated with syphilis, only half developed evidences of primary lesions, while in every case the controls developed chancres in the usual manner.

Because of the unreliability of the histories of such patients, even when associated with a history of past miscarriages, stillbirths or macerated fetuses, we must fall back many times on the serologic findings of the blood and spinal fluid in order to arrive at a satisfactory diagnosis of the disease. Here again we are confronted with divergent opinions as to the value of Wassermann reactions during pregnancy. The late Fordyce and Rosen[5] concluded that 25 to 35 per cent of all pregnant women who have a strongly positive reaction with the cholesterinized antigen gave negative Wassermann reactions with all other methods several weeks after delivery. De Lee,[6] in his book on obstetrics, also states that due to the existence of false positives, the Wassermann reaction had only made "confusion worse confounded," and was, therefore, valueless in these cases.

Such beliefs, however, are at present in the minority. Following modifications and improvements in our serological tests, it has become accepted by such men as McCord,[7] Gammeltoft,[8] Halloran,[3] Kilduffe[9] and others that a strongly positive Wassermann reaction confirmed on one or more occasions during pregnancy, constitutes definite proof of the presence of a syphilitic infection. On the other hand, it is also a recognized fact that many syphilitic women may develop negative reactions during the latter months of pregnancy when they have been subjected to a minimum amount of treatment or no treatment at all.

McCord[7] has observed that of 173 pregnant women with strongly positive Wassermann reactions, this test changed in 95 cases from positive to negative at the time of labor. Funkhouser and Dickson[10] reported that of 73 mothers who gave birth to offspring with four-plus cord Wassermanns, 20 showed a negative blood Wassermann at the time of delivery. Moore[11] also brought out in his study of 200 pregnant women, 32 of whom had demonstrable secondary syphilis, that 10 per cent of the latter group gave a negative blood reaction.

In spite of the apparent unreliability of serologic tests on pregnant women as shown by the above quoted opinions, and many other similar ones not cited, we feel that the safest position to hold is that a pregnant woman whom we find to have a four-plus Wassermann reaction is syphilitic.

TREATMENT OF SYPHILIS IN PREGNANCY

It has long been accepted by some physicians that since pregnancy acts as a partial cure for syphilis, repeated pregnancies may ultimately effect a complete cure of the patient, even in the absence of any supplementary medical treatment. Others, like Findlay,[12] have stated that adequate antisyphilitic treatment carried out through one pregnancy is sufficient to insure the birth of healthy offspring in the following pregnancies, but unfortunately for members of the second generation, repeated experiences have proven the disastrous fallacy of such beliefs. At present the opposed opinions of such men as Schamberg and Wright[13] in this country and Gammeltoft[8] in Denmark are coming to be generally recognized. They believe that no time limit for the transmission of syphilis from parent to child can be fixed. Of 143 replies to a questionnaire sent out by the Venereal Institute at Moscow[14] on the advisability of antisyphilitic treatment of pregnant women who had previously been subjected to abortive and seemingly adequate treatment of this disease, more than half were in favor of prophylactic treatment during pregnancy, irrespective of previous treatment or the duration of the negative period. Among the advocates of such therapy were Clement Simon, Wile, Jeanselme, Ravaut, Buschke, Herxheimer, Max Joseph and Gammeltoft. Jadassohn, Bruno Block, Schamberg and others advised treatment if less than three years had elapsed between the time of infection and pregnancy. In many replies, cases were cited in which women had received prophylactic treatment and remained seronegative for years and then given birth to a syphilitic infant.

In the same investigation a question was asked regarding the advisability of treatment of apparently normal pregnant wives of latent syphilitic husbands who had received treatment some time before. Of the 140 replies to this question, 40 per cent advocated treatment in every case irrespective of the husband's serological reaction and symptoms. This opinion was also substantiated in a number of instances by the history of women who had remained seronegative until after the birth of an infected infant and then developed a positive Wassermann reaction. The other 60 per cent advised maternal treatment only under certain conditions relating to the duration of the husband's infection, the amount of his treatment, and the length of his period of seronegativity.

In spite of such evidence pointing to the advisability of prophylactic treatment for all pregnant women suspected of having syphilis, we have been forced to limit prenatal antisyphilitic treatment to those women who show a strongly positive blood Wassermann or positive symptoms, since in a municipal hospital, where approximately one-half of the patients are colored and the majority of these have a syphilitic background, due to our limited clinical facilities, it would be physically impossible to treat all those suspected of having the disease.

In those cases in which the diagnosis of syphilis is certain, it is important that their treatment be commenced as early as possible, since we know that the fetus may become infected at any stage of its development. Prenatal syphilis has been separated into two divisions: the embryonic and congenital. The former is the more serious, attacking the embryo during the first few months of pregnancy and usually resulting in its death and early abortion. The latter, due to an infection of the fetus any time after the fifth month, may cause a premature termination of pregnancy, but usually these gestations go to full term and then end with the birth of a dead fetus or a living infant infected with the disease. Some of these living babies show florid manifestations of the infection at the time of delivery, but when this occurs they usually die within the first week or ten days; others, due to the mildness of their infection or to some special but unknown defense mechanism, appear normal at birth, but develop clinical signs of congenital syphilis from a few days to a few weeks later. In a still smaller percentage, the

infection remains latent for years, only to appear around the time of puberty and in rare cases it may not manifest itself until still later in life.

It is in an effort to protect the second generation against these late syphilitic infections that prenatal treatment is particularly directed, and as it is generally believed that these infections occur about the fourth or fifth month. If treatment is instituted prior to that time, the chances for the birth of a normal, non-infected infant are very great. Even in those cases in which treatment is commenced much later and is theoretically inadequate, much may be accomplished, and I agree with Marshall,[15] who has stated that the results of treatment of these infected mothers is often remarkable, "for the amount which ordinarily would seem meager protects in a large percentage of cases both the mother and her offspring." Moore, in discussing a recent paper by Wile and Shaw,[16] disagreed with the opinions voiced to the effect that the fifth month of pregnancy represented the deadline of effective therapy, and said that he believed that much good could be accomplished by treatment given as late as the eighth or ninth month and thought it never too late to treat the syphilitic pregnant woman.

Because of these facts and because of the belief held by many that fetal infection is more apt to occur around the fifth month of pregnancy, we attempt to reach the maximum intensity of our prenatal therapy between the fourth and seventh months, relying mainly on the arsenicals during that time and then tapering off our treatment during the latter period of gestation when the maternal organism is already overburdened by the products of fetal catabolism.

VALUE OF PRENATAL ANTISYPHILITIC TREATMENT

The effectiveness of prenatal antisyphilitic therapy at present is universally recognized and as an example of its value we may cite the observations of Starr[17] that of 74 syphilitic mothers treated at the Louisville City Hospital during pregnancy, 67 had living babies at the time of their discharge from the Hospital, ten days post partum; while of 63 syphilitic mothers who received no treatment during pregnancy, only 32 had living babies at the end of the same time. Gammeltoft[8] has also stated that a non-treated syphilitic mother will practically always give birth to a syphilitic child. In comparing the outcome of pregnancies of 100 untreated syphilitic women with 100 who had received treatment during their pregnancy, Bartholomew[18] found premature births twice as frequent, stillbirths three times as frequent, abortion seven times as frequent, and infant deaths up to ten days post partum nine times as frequent in the untreated as in the treated women.

Of the group of women studied in my series there were 11 primiparas and 40 multiparas. The latter had averaged four pregnancies apiece. Together they gave histories of having been pregnant 177 times and of these pregnancies, 15 terminated in miscarriages of less than four months, 13 in abortion of over four months, 7 in full-term stillbirths, 21 in full-term infants who lived only a few hours or a few weeks, and there were 58 living children who later developed definite symptoms of congenital syphilis. Sixty-three living children, ranging in age from four months to over twenty years, are apparently normal, but it is logical to assume that some of these children represent latent syphilitics who in the future will develop evidence of the disease.

From this summary we see that together 51 mothers had had 114 pregnancies that ended disastrously, and it is fair to assume that most of them were the result of syphilis. Such statistics are a depressing commentary on the present menace of syphilis and the failure of modern medicine in its fight against the disease. These gloomy conclusions, however, are brightened by the fact that the women had been married on an average of nine and one-half years, and that 17 gave no history of any antisyphilitic therapy, while the remaining 34 had averaged less than three years of treatment and many of their abnormal pregnancies antedated this period.

SEROLOGIC REACTIONS IN CONGENITAL SYPHILIS

Among 68 children examined, there was an equal number of colored and white; there were 25 males and 43 females, or almost twice as many of the latter. Their ages ranged from two weeks to sixteen years. Eighteen were less than one year old; 20 between one and five years, and 30 between five and sixteen years.

The Kolmer modification of the Wassermann test was used exclusively. Sixty-four children gave a strongly positive blood test on one or more occasions, while in 4 cases the blood remained persistently negative, but because of a positive maternal history and physical stigmata of congenital syphilis, these 4 were also included in this group.

Examinations of spinal fluids were made on 54 of these children: 50 were completely negative, 3 showed a four-plus reaction, and 1 a two-plus reaction. The cases with positive spinal fluid also showed strongly positive blood reactions.

The diagnosis in most of these cases was definite, but in some the only evidence of congenital syphilis was found in the positive blood Wassermann reaction, while in a few the diagnosis was based on a suggestive maternal history and a positive reaction of the cord blood.

The value of a positive cord Wassermann reaction is still a debatable question. Many physicians believe that it has no significance and that the blood Wassermann test of the infant's blood for the first few weeks or months of life is equally valueless. Innumerable cases have been cited where such positive Wassermann reactions became spontaneously negative later on, but on the other hand, probably as much evidence has been accumulated to show that a negative Wassermann reaction in this same period is inconclusive, for congenital syphilitics may remain symptomatically and serologically normal even up to the time of puberty and then develop serologic evidence of the disease.

McCord[7] believes that a strongly positive Wassermann reaction of the cord blood, sinus blood, or spinal fluid means the infant has syphilis, and a seronegative reaction on anyone of these three means absolutely nothing, since only 42 out of 229 syphilitic infants gave strongly positive reactions. McCord[19] has also reported that of 200 syphilitic fetuses which came to autopsy, in 88 cord Wassermann reactions had been taken and 68 of them were negative.

Lemez[20] has shown that examination of the blood of 271 newborn infants by the Wassermann, Sachs-Georgi, Meinecke and Meuller tests gave 18 per cent positives on the first examination; but that in most of the positive cases the reaction became negative in three to five days. He believes that in the first two weeks of life both healthy and syphilitic infants may give a positive non-specific serologic reaction, and he considers these serologic examinations, for the first eighty days of life, of no value. In contrast with this observation, Dutton[21] found that the Kahn test run on the cord blood of 100 rigidly examined non-syphilitic infants gave not one false positive reaction.

Fildes[22] considers that a positive Wassermann on the cord blood means syphilis in the mother rather than in the child, while Kolmer believes it means syphilis in both. Stokes does not commit himself upon this point.

Since it appears after consideration of such statements as these that the evaluation of serologic reactions in newborn infants is largely a matter of personal opinion, we have taken a stand, not acceptable by many, that the presence of a strongly positive cord Wassermann, even in the absence of other confirmatory evidence, is sufficient to warrant the institution of immediate antisyphilitic treatment of the infant.

PHYSICAL SIGNS OF CONGENITAL SYPHILIS

In my examinations, I found that 20 of the 68 children showed no physical signs of the disease except a four-plus Wassermann, although 10 of these gave histories of having developed snuffles, epiphysitis or a skin eruption shortly after birth. The other 48 children presented one or more of the diagnostic signs of congenital syphilis. Eight had interstitial keratitis, varying in intensity from scattered nebulae to complete opacities of the cornea; 6 had Hutchinson's teeth; 1, mulberry molars; 7, eighth-nerve deafness; 2, Argyll-Robertson pupils; 3, unequal pupils; 4, saber shins; 2, radiating perioral cicatrices; 2, Clutton's symmetric hydrarthrosis of the knee joints; 1, a perforated nasal septum; and 1, a specific macular eruption. Of the secondary signs, 15 showed a high, narrow, palatine arch; 9, sluggish or absent knee jerks; 11, prominent frontal bosses, 6 of which were associated with marked facial asymmetry; and 5 showed scaphoid scapulae. Of the suggestive but not diagnostic signs, 18 had a thinned-out hair line; 4, Carabelli tubercles; 8 were markedly undeveloped; 1 was hydrocephalic; 5 showed delayed dentition; 3 palpable spleens; and 1, venous ectasia of the scalp.

One of the cases examined was a male colored infant, two years old, who showed a four-plus blood Wassermann and who had a history of having developed snuffles at birth, and a skin rash, which cleared up under antiluetic treatment. He had also had epiphysitis when one year old. When first seen he presented the picture of a little, old, pot-bellied, spindled-legged, weazened up man. He showed evidence of a fading, generalized skin eruption, maculae of both cornea, a persistent nasal discharge and cried almost continuously with a harsh, aphonic voice. There was a scar on the right side of his neck, the result of a previous suppurative anterior cervical adenitis, and his right epitrochleal lymph node, which was enlarged to the size of an olive, had a discharging sinus connected with it. The right middle finger presented a fusiform enlargement, the center of which had also broken down, although it showed no discharge. The remaining fingers appeared perfectly normal. The tuberculin test was positive. X-ray examination of his chest revealed greatly enlarged mediastinal lymph nodes, strongly suggestive of glandular tuberculosis. Films of the extremities showed evidence of moderately advanced rickets and also imperfect development of the epiphysis, periosteal thickening of the anterior border of the right tibia and osteoperiostitis of the distal extremity of the left radius. These latter signs are considered typical of the bone changes seen in congenital syphilis. X-ray examination of the

middle finger of the right hand gave no additional information.

This child apparently presented a syndrome of rickets, glandular tuberculosis and congenital syphilis. The question of the etiology of the changes in the right middle finger was unsolved, for as Stokes[22] has pointed out, the fusiform swelling of the proximal phalanx rarely softens and breaks down in syphilis as it does in tuberculosis, and also the tuberculous process is usually solitary, while the rachitic and syphilitic types are generally multiple.

MENTALITY OF CONGENITAL SYPHILITICS

Five of these children showed definite evidence of mental retardation, but only one of them had a four-plus spinal fluid. The mental development of the other children seemed perfectly normal; in fact, a few appeared abnormally bright for their ages. This precosity has been observed by Stokes,[22] who states that 12 per cent of the congenital syphilitic children observed by him showed mental development well beyond their years.

However, it is an undisputed fact that in spite of these rare cases, congenital syphilitics for the most part show either a normal intelligence quotient or are slightly below normal in this respect.

Woodall,[23] in a study of 1,014 mentally deficient children, found that 6.5 per cent were congenital syphilitics. Jeans and Butler[24] reported that of 83 families of congenital luetics, 20 per cent had one or more defective children, while only 4 per cent of the families of non luetic children had one or more defectives, and in a study of 100 cases of late congenital syphilis, Veeder[25] found that 23 per cent were mentally deficient. However, such children are more apt to show only slight mental deterioration rather than mental changes of the more extreme types. This belief is substantiated by the study of Dayton,[26] who found that among 61 patients with congenital syphilis associated with mental deficiencies the intelligence level was definitely above that of 1,956 cases of mental deficiency from other causes.

INDICATIONS FOR TREATMENT

The subject of therapy brings up one other question which still needs clarifying, and that is, which children of syphilitic parents should receive treatment? We of course recognize the necessity of treating those children in whom the definite diagnosis of congenital syphilis has been made, but what of those children of syphilitic parents who are clinically and serologically negative at birth and shortly thereafter? It is a known fact that a considerable number of congenital syphilitics may remain apparently healthy for months or even years before developing symptoms of the disease.

Klaften[27] has shown that of 48 apparently healthy children of mothers with latent syphilis who received antisyphilitic treatment during infancy 2 died, 3 developed symptoms of syphilis during treatment, and 43 remained healthy with negative laboratory tests; while of 84 similar children who were not treated, only 46 remained alive and free from symptoms after the first three months.

Because of many such reports as this, there has arisen one group of syphilographers supported by Klaften, Carle, Welander, and Beck, who advocate the treatment of all infants of syphilitic parents. On the other hand, such men as Gammeltoft, Ahmann and Almkvist hold that suspected children should never be treated until they show clinical signs of syphilis or a positive serologic test. Gammeltoft[6] quotes Almkvist as saying:

> "It has always been considered an unscientific procedure to start treatment of the adult suspected of having syphilis until a definite diagnosis had been made, and the same should hold true for infants."

Unfortunately it does not appear to me that this analogy is a suitable one, for we know that a far greater percentage of congenital syphilitics remain latent than do cases of syphilis of the acquired type.

In view of this recognized possibility and because it seems in the light of such studies as that of Morgan[28] that the prognosis for the serologic cure of congenital syphilis is directly related to the age at which treatment is instituted, we feel that it is far fairer to risk the possibility of placing the unmerited stigma of congenital syphilis on a few untainted infants while treating the group as a whole than to treat only those infants with definite evidence of the disease, recognizing that at the same time we are leaving untreated a fairly large percentage of children who will later develop symptoms and signs of syphilis, but who during its untreated latency will probably forfeit their chance of obtaining a permanent serologic cure.

In treating these children we have generally adhered to the method advocated by the late Fordyce and Rosen,[29] giving alternating courses of neoarsphenamine and mercury, 6 of the former and 15 of the latter constituting a course, and continuing these courses with little or no rest period between them until at least three courses have been given. After that, the extension of the treatment period depends entirely upon the serologic response of the patient. Under this regime most of our children have shown marked symptomatic improvement, and although in a few cases the blood tests have changed to

negative, the duration of their treatment and observation has not been sufficiently long for us to consider them permanently cured.

Finally, it is important to emphasize the fact that the successful treatment of congenital syphilis requires the institution of this treatment as early as possible, and then patience and persistence on the part of the physician and the complete cooperation of the patient. The truth of this belief has been clearly brought out in Morgan's[28] recent paper, in which he showed that where treatment was commenced before the children were one year old, eight and one-half months was the average time of continuous treatment necessary to obtain a permanently negative blood test; thirty-one months were required where the children were between one and five years old, and thirty-four months where they were over five years of age. Finally in one group of 35 congenital syphilitics, 12 were rendered serologically negative only after more than five years of almost continuous therapy.

CONCLUSIONS

(1) The study of 51 syphilitic women and 68 congenitally syphilitic children referred to in this paper brings out no new knowledge relating to the disease, but it brings to our attention certain problems related to its diagnosis and treatment.

(2) It is extremely difficult to hold to attendance for a satisfactory period of treatment the class of patients represented in a clinic for congenital syphilitics.

(3) The diagnosis of syphilis in pregnant women is many times dependent upon the evidence obtained by the blood Wassermann reaction, and in spite of the possibility of the occasional existence of non-specific false positive reactions during pregnancy, all women giving a strongly positive Wassermann on one or more occasions may properly be considered syphilitic.

(4) The earlier in pregnancy antisyphilitic treatment is commenced, the better are the mother's chances for bearing a healthy infant, but there is no time limit for beginning treatment, as much good may be accomplished by treatment instituted as late as the eighth or ninth month.

(5) Repeated pregnancies do not constitute an effective cure for syphilis, and much evidence has been accumulated to show that every pregnant woman with a history of syphilis should receive antisyphilitic treatment during that period, irrespective of the duration of her infection, the amount of previous treatment or the period of her seronegativity.

(6) It has also been shown that apparently healthy wives of husbands with treated syphilis should receive antisyphilitic treatment during pregnancy, especially if the husband's infection occurred less than five years before.

(7) Prenatal antisyphilitic treatment is of unquestionable value in increasing the percentage of healthy infants born of syphilitic parents.

(8) The diagnosis of congenital syphilis is dependent upon the recognition of symptoms and signs of this disease and serologic examination of the blood and spinal fluid, but since it is a recognized fact that the blood Wassermann reaction for the first six weeks of infant life is undependable, it should be checked repeatedly during the first six months in questionable cases.

(9) Because of the high percentage of congenital syphilitics who may remain symptom-free and seronegative for months or years, we feel justified in treating all children of syphilitic parents.

(10) The prognosis for a serologic cure of congenital syphilis depends largely upon how early treatment is commenced and how long it is persisted in. The prognosis is good in most cases where treatment is instituted before the end of the first year, but with the advance of age, the prognosis of untreated cases becomes progressively worse.

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DISCUSSION (*Abstract*)

Dr. L. W. Lord, Baltimore, Md.—The main points which this paper brought home most forcibly to me were the marked lack of effective standardization which exists in the treatment of prenatal and congenital syphilis in various clinics.

There is great diversity of opinion concerning a number of important points which Dr. Rutledge touches on. The most obvious are these:

(1) The question of the value of antisyphilitic therapy when started late in pregnancy.

(2) The question of whether an apparently normal non-syphilitic woman negative serologically, married to a known syphilitic man, should receive treatment.

(3) The value of the cord Wassermann as an indication of congenital syphilis.

(4) The value of the Wassermann reaction in the newborn in contradistinction to the Wassermann performed a number of weeks or months after birth.

(5) The question of treatment of clinically and serologically negative children of known syphilitic mothers.

(6) The question of treatment of women apparently adequately treated previously during successive pregnancies.

These six points occurred to me on reading Dr. Rutledge's paper, and the marked diversity of opinions held by syphilologists throughout the country forces me to the conclusion that here are a number of problems which demand clarification.

Taking the points which I have enumerated in order, the first question is that of the value of antisyphilitic treatment of women late in pregnancy.

I am sure that everyone here has seen occasional startling and gratifying results from 2 or 3 injections of arsphenamine just before delivery, and, therefore, I am sure no one would withhold therapy merely because the patient was seen just prior to term.

The actual value of this treatment, however, can only be determined by careful statistical study, and not by the general impression which one obtains from casual observation.

The second question is that of treating apparently normal wives of syphilitic husbands. Statistics again will answer this problem. Are we to subject thousands of innocent and non-syphilitic women to the physical hardships and mental anguish of antisyphilitic treatment when there is no need for this, or are we to allow them to remain untreated and risk congenitally syphilitic children, imposing on them the stigma and handicap in life that goes with this disease. Careful study and statistics again will answer this question.

The value of the cord Wassermann on newborn children of syphilitic mothers and the value of the Wassermann reaction in the newborn in contradistinction to the Wassermann performed a number of weeks or months after birth has been a subject of debate for two decades. I do not think I need go into this subject further than to call it to your attention.

The question of treatment of clinically and serologically negative children of known syphilitic mothers is much the same as question 2, with the hardship placed on the child rather than on the parent. I, personally, believe that careful and regular follow up of these children with Wassermann tests and physical examinations at regular intervals, with at least one spinal fluid examination, is sufficient and good therapy. Of course, in this way we risk the development of late congenital syphilis and the acknowledged increased difficulty of effecting cures, but, on the other hand, we escape imposing the hardships of treatment on many patients who do not need it.

The treatment of women apparently adequately treated previously during successive pregnancies is the extremely important problem. Here again opinions differ widely. Once more statistics must be brought into play to solve this problem, the same problem of subjecting individuals to unnecessary hardships of treatment.

On this Continent careful and accurate follow-up is difficult as compared to the European nations, where migrating individuals are carefully located by the government. So many persons, and particularly the irresponsible syphilitics, migrate from town to town and from one address to another in the same city that follow-up work of this character is most unsatisfactory.

I object to Dr. Rutledge's statement that pregnancy acts as a partial cure for syphilis and suggest rather

that pregnancy acts as a deterrent to the ravages of this disease.

Dr. Harry M. Robinson, Baltimore, Md.—We do not necessarily treat the wives of syphilitic husbands, but we do examine all contacts of our cases where possible, and where there is evidence of syphilis, serological or clinical, we prescribe treatment.

We treat the mothers of syphilitic babies regardless of whether the mother shows positive or negative symptoms or serum reactions.

It is my habit to treat the babies of syphilitic mothers, especially if those mothers have had what we call insufficient treatment.

Dr. Charles C. Dennie, Kansas City, Mo.—The frequent observation that a small amount of treatment of the mother will produce a living child is an interesting observation, but a dangerous statement. If the mother receives treatment during the latter part of her pregnancy the child is apparently all right and with a negative Wassermann reaction. I have been following these children and find that a good percentage of those with a negative Wassermann reaction of the blood and no signs of syphilis have a positive spinal fluid. The assumption is that these children will go on for years and show no evidence of syphilis. It may be that they will never show evidences, but it seems likely to me that later they will develop the signs and symptoms of cerebrospinal syphilis. I have placed the dead line of treatment of mothers at the fourth month. I do not mean that these mothers should not be treated as long as it is possible to treat them, but I think the fourth month represents the dead line of proper results. At the fourth month of pregnancy the periosteum of the bones is well formed and the *Spirocheta pallida* lie under the periosteum of this bone frame work. No matter how much treatment the mothers receive after the fourth month, the children are likely to show stigmata of syphilis: the notched teeth and the deformity of the upper jaw. If a mother comes at the eighth month of pregnancy I would rather take the chance of leaving her untreated until after the birth of the child and treating the child as well. I would give the mother a thorough course of treatment every time she became pregnant, no matter how often that might be.

Dr. Dudley C. Smith, University, Va.—Dr. Dennie may be right in having a "dead line" in the treatment of syphilitic mothers, but there is a difference of opinion in regard to this. Clark's statistics show that at any stage in a pregnancy complicated by syphilis more normal children are born following treatment of the mother than without it. It is an usually accepted principle that the earlier anti-syphilitic treatment is started the better the prognosis. It would seem logical, then, to begin the treatment of both the mother and fetus as early as possible. There is both a prophylactic and therapeutic value from the standpoint of the fetus in treating a syphilitic mother at any time before delivery.

Dr. Rutledge (closing).—The final solution of the best methods of treatment of syphilis depends upon the careful evaluation of a large number of cases. Observations on a few cases do more to confuse the situation than to clarify it.

THE USE OF ALLYLISOPROPYL BARBITURIC ACID IN LABOR*

By JOHN E. HOBBS, A.B., M.D.,
St. Louis, Mo.

Within the last three decades many drugs and combinations of drugs have been used in an attempt to alleviate and abolish pain during labor. The outstanding examples are nitrous oxide, morphine-hyoscine, and Gwathmey's synergistic analgesia. During the past two years a voluminous literature has accumulated on the use of barbituric acid derivatives in surgery and obstetrics. Somnifene, which is a combination of two hypnotics, diethyl barbituric acid or barbital and allylisopropyl barbituric acid or numal, has been used in Europe since 1921. In 1923, Cleisz, a Frenchman, developed its use in obstetrics.

About 1927, Bumm, a German, used a 10 per cent aqueous solution of the sodium salt of the secondary butyl-B-bromallyl barbituric acid (pernocton) for surgical anesthesia. During the past two years a great deal has been written on its use in obstetrics.

Sodium iso amylethyl barbiturate (sodium amytal) has been used for a number of years to produce surgical anesthesia in laboratory animals. McCallum, in 1928, was the first to use it intravenously in humans. Since that time there have been many reports of its use during labor. It has been administered orally, intravenously, intramuscularly and rectally.

Another barbituric acid derivative which has been used extensively in Europe, both in surgery and obstetrics, but very little in the United States, is allylisopropyl barbituric acid, or numal. To my knowledge, there is only one report of its use in the American literature. Fjelde, in 1929, asserts he has used it in surgery to his satisfaction, but does not give an analysis of his cases.

I shall now report our experiences with numal in obstetrics from a series of 231 cases delivered in the St. Louis Maternity Hospital. At this time I wish to express my appreciation, especially to Dr. S. D. Soule, the Resident House Officer, whose cooperation has been invaluable

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in observing many of these patients and recording the data.

REQUIREMENTS OF A GOOD ANALGESIA

The criteria of an ideal analgesic in obstetrics are: first, the drug must abolish all memory of pain; second, there must be a wide margin of safety in dosage; third, there must be no harmful effects on the mother or child; fourth, the progress of labor must not be delayed. That these requirements have never been met is indicated by the number of drugs which are being used. With these requisites in mind, we are making an earnest attempt to determine the value of numal in labor.

PHARMACOLOGICAL ACTION

Numal is a Hoffman-LaRoche preparation, a derivation of the malonyl-urea group. It is prepared in ampoules, each ampoule containing 2.2 c. c., the equivalent of 0.22 gm., of allylisopropyl barbituric acid. (Allylisopropyl barbituric acid is the hypnotic principle in allonal and elixir alurate.) Thus far the drug has been released only for experimental purposes. Its hypnotic index is about five times as high as barbital, while its toxicity is relatively less. Calculating the body weight dosage for a *Macacus rhesus* monkey as in humans, it required five times the therapeutic dose to kill the monkey. It is easily destroyed in the body and eliminated at a rapid rate in the urine. Therapeutic doses disappear from the system in less than 24 hours and over 80 per cent of the substance actually disintegrates and becomes inactive. Other barbiturates break down to a much smaller extent; barbital only about 30 per cent, and it requires several days for elimination. Traces can be found in the urine up to the eighth and ninth days after administration.

Numal has the highest lipoid solubility of all the barbiturates, which is exceedingly important in producing hypnosis. As a result of this high lipoid solubility, sleep is produced quickly, usually within two minutes or after 2 c. c. of the drug have been injected.

Numal acts directly on the cerebrum and not on the spinal cord, which is important from an obstetrical standpoint. Most of the drug is fixed in the nerve centers, but a slight amount is retained in the liver, kidneys, and other tissues.

Numal, in doses sufficient to produce amnesia for a period of several hours, has no appreciable effect on the cardio-respiratory apparatus. In a few cases we have noted a drop in blood pressure of 5 to 10 mm., which will immediately return to normal. This occurs at the time the patient goes to sleep and occurs normally in physiological sleep, so one cannot attribute this fact to numal. In many cases we have noted a slight decrease in number and depth of respiratory movements, but nothing alarming. Here again this may be explained as a normal phenomenon. In toxic doses in animals, numal produces a respiratory death which is true of the other barbiturates.

Kidney and liver function are not disturbed in any way. Two monkeys were given repeated large injections and then killed by toxic doses. An examination of sections of the livers and

Table 1

EFFECT OF THE DRUG WITH REGARD TO MEMORY AND PAIN

	Complete Amnesia	Fair Analgesia		No Effect		Post Delivery Interview Lacking
Primiparae	72	8	7-6 c. c. intravenously 1-5 c. c. intravenously	4	4 c. c. intravenously 6 c. c. intravenously 5 c. c. per os 5 c. c. per os + Hy.	8
Multiparae	83	20	1.3-6 c. c. intravenously 7-5 c. c. intravenously	29	18-6 c. c. intravenously 8-5 c. c. 2-6 c. c. per os 1- ?	7
Total cases	155	28		33		15
Actual per cent	71+	12+		15+		
Corrected per cent	79+	10+		10+		

From the above table it is obvious that among those having "fair analgesia," 7 multiparae and 1 primipara had inadequate dosage (5 c. c. and less) and no doubt several of the others did not have the correct dose. Among those listed as "no effect," one can eliminate 10 multiparae and 3 primiparae as having too little; several of these were given orally. Including the 15 which we cannot classify, a total of 36 cases should not enter into the percentage. The actual and corrected percentage is recorded in the above table.

kidneys did not show any pathological lesions, either macroscopically or microscopically. Neither have we noticed any clinical manifestations of irritation, that is, no albumin or blood in the urine. Other observers have found that the glyco-regulatory mechanism is not affected as revealed by spontaneous glycosuria, and after injection of sugar. Studies of the blood chemistry have revealed nothing unusual in these cases. All of these results confirm those of European investigators.

DOSAGE AND TECHNIC OF ADMINISTRATION

The dosage and technic of administration will now be considered. The patient should be allowed to continue in labor until the contractions become painful, which of course, is an individual variation. In general we start the injection in primiparae when the cervix is about two to three fingers dilated, in multiparae, as soon as the contractions become painful. The patient should be in a quiet room free from external stimuli. The one responsible for the patient should gain her confidence and tell her what to expect; thus the patient seems to relax better and there is less excitation, a fact which we have repeatedly observed in twilight sleep. Suggestion is important in these cases.

Numal may be given orally or intravenously. Orally, the drug is absorbed slowly with delayed action and the effects last longer. Early in our experience we used it orally in 13 cases, and because of insufficient dosage our results were disappointing. Patients were restless and drowsy for a longer period of time and memory of pain was not abolished. Intravenous administration seems to be the preferable method.

As stated before, the drug is in ampoules and needs no dilution. A sterile 10 c. c. syringe, fitted with a No. 23 gauge needle, a tourniquet, and alcohol are all that is needed in the way of equipment.

One should seat himself comfortably at the bedside and prepare to inject the drug into the median basilic vein of the arm. Our first injection of 3 c. c. was inadequate and we have increased the dosage gradually until we have found the minimum effective dose which is 1 centigram per kilo of body weight. Independently, we find this dosage corresponds to that of European investigators. The drug is injected at the rate of 1 c. c. per minute. At the end of about two minutes the patient becomes drowsy and usually does not remember the removal of the needle. The patient generally sleeps between contractions and may complain, carry out commands, but the next day is unable to recall any events following the injection. Occasionally the contractions are slowed, which can be remedied by the use of pituitary preparations in one to two minim doses. On the other hand, in the majority of cases we see a rapid labor, a condition which occurs too frequently to be without significance, the explanation of which is not clear. Other observers have had this same clinical experience.

RESULTS

In analyzing our series of 231 cases, we have the results shown in the tables.

CONCLUSIONS

From this preliminary report of 231 cases, I feel justified in the following conclusions:

(1) When given in proper doses, numal produces complete amnesia in about 80 per cent of the cases, fair analgesia in 10 per cent, and in the other 10 per cent, slight or no effect.

Table 2

SUMMARY OF LABOR AND DELIVERY

Average Dilation when Given	Average Duration of Labor After Injection	Type of Delivery	Anesthetic at Delivery	Effect on Child
Primiparae 3 to 3½ fingers	Primiparae 2½ hours	Forceps and Episiotomy 94	None 8 primiparae	7 required slight stimulation
Multiparae 3 fingers	Multiparae 1 hour	Forceps alone 9	Perineal forceps and episiotomy	
		Episiotomy alone 2	None 26 multiparae Spontaneous	
		Spontaneous 125	Nitrous oxide 82 cases	
		Version 1	Chloroform and ether (very little) 115	

There was one maternal death, in no way attributable to numal. The patient was a very severe eclamptic and post mortem examination revealed a markedly damaged liver. The child was non-viable.

(2) There are no harmful effects on the mother or child.

(3) Labor is in most cases accelerated or normal.

(4) Hemorrhage is not increased as the reflexes are not impaired.

(5) It requires a very small amount of anesthetic at the time of delivery or none at all. Nitrous oxide, chloroform, or ether may be used safely.

(6) There are no contraindications to its use. We have used it in every common type of obstetrical abnormality.

(7) It is especially advantageous in cases of multiparae having a rapid labor.

We have had no maternal deaths in our series. Likewise, in Europe, where the drug has been used in hundreds of cases of surgery and obstetrics, no deaths have been reported. In our opinion, the drug has a wide margin of safety, but we recommend that it be used in a well regulated hospital under capable supervision.

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DISCUSSION (*Abstract*)

Dr. Arthur A. Caire, Jr., New Orleans, La.—Sodium amytal has not proved the panacea for pain in childbirth that has been claimed for it by many writers. I have found it necessary to use morphine and very often, hyoscine also, during the first stage of labor to obtain analgesia. Sodium amytal always requires a general anesthetic and usually a quite deep anesthesia during the second stage of labor, due to its disquieting effect on the patient when her pains become hard.

I was interested to note how rapidly delivery was accomplished under the influence of numal, but personally disapprove of any medicine that has to be given intravenously to a patient in labor for analgesic purposes. Perhaps that is just an idea, but I well remember when we first started using sodium amytal which had to be given intravenously, some of the results we obtained. Especially the collapse of the circulatory system in a few cases, and always a cerebral irritation, frightened us a great deal. Sodium amytal also gives a marked drop in blood pressure whereas numal, causing a drop of only ten points, seems to be safer.

Is there any disquieting effect from this drug as the patient comes out from under its influence? Sodium amytal always requires a dose of morphine when the patient begins to react, the patient being allowed to awaken from the effects of morphine and not from sodium amytal, because of the obstreperous manner in which practically all cases react to sodium amytal.

Dr. Hobbs' results are certainly better than any I have been able to obtain in attempting amnesia or analgesia in parturient women.

Dr. Warren E. Massey, Dallas, Texas.—When we first began to use sodium amytal we gave it intravenously. We have given it to various types of patients and in various size doses. We have found the disappointing qualities that Dr. Caire has mentioned. Nevertheless, I think relief of pain by the administration of barbituric acid derivatives is a great blessing for those in the practice of obstetrics. Since we have so many different types of individuals it is hardly to be supposed that any drug will give uniform results. We have given sodium amytal to a group of about 60 patients and have had no bad results, but it has qualities that make me hesitate before giving it to each patient. I have decided that the question of the relief of pain should be discussed with the patient before labor, that she should know thoroughly the physician's plan, and that if she gets complete relief from pain it may at times endanger her welfare and also that of the baby. Pain is the one thing that women as a class dread more than anything else. If we operate upon them their main thought is to be completely relieved of any memory of pain; they clamor for anything that will relieve pain, not knowing what the result may be. Sometimes the doctor is influenced to go ahead and against his better judgment give a drug with which he is not familiar. It is my opinion that the patient should realize that there are cases and there are conditions in which she cannot be given the same drug which was given to another patient.

Dr. W. T. Pride, Memphis, Tenn.—I have used sodium amytal in 800 private cases. I do not depend on it entirely. As soon as the patient is in good labor we routinely give six grains of sodium amytal per rectum; in thirty minutes, if the patient is not relieved to a sufficient degree we give one-sixth of morphine and 1/200 of scopolamin. This will carry the patient from two to four hours. We expect in that time that she will be delivered. If she is not, we do not hesitate to repeat the sodium amytal.

Dr. Hobbs does not give his drug until the patient has had most of her pains. I was in Sloan's Hospital last year, where pernocton was being given. The interns who were giving it said that they made it a rule to have two to two and a half fingers' dilatation before it was administered. I said: "That is all right as these are ward patients, but when you go out in practice if you expect your patient to return, you had better ease her before that time." Ward patients do not receive the consideration that we give private patients.

We have given sodium amytal with good results in 800 cases so far, and have studied it from every angle, but we do not give all patients the same thing. We give one patient perhaps 6 grains of sodium amytal per rectum and nothing else. We may give another patient two doses. We study the patient. The patient usually says: "I do not remember that I ever had any labor." In one patient we had to induce labor with quinine, castor oil and pituitrin. The next morning she did not know she had had the baby. We have never had an anesthetic accident, fetal or maternal. We have not had the experience the Doctor speaks of, that the patient has waked and had to be restrained.

We give gas for delivery. Sodium amytal in combination with morphine and scopolamin has been ideal in our experience. If the Doctor can give us something that will eliminate the necessity of morphine and scopolamin, we shall be very glad to have it.

Dr. R. A. White, Asheville, N. C.—The analgesic that will not work at all in one case, in another will work with only one dose, and the analgesic that is applicable to one condition cannot be used in another. I feel very much as Dr. Pride does about when to give the anesthetic. In a case of persistent occiput posterior in a primapara, if you wait until you have three fingers dilatation, the patient will go to somebody else next time.

I have found that sodium amytal does not slow down the first stage of labor, and often is given with only one finger dilatation if the pains are assuming a regular rhythmic character. I do not hesitate to give it as soon as the pains are definitely established, regardless of the amount of dilatation, and certainly if the membranes are ruptured it may be given immediately. Sodium amytal has the advantage that it may be used in any one of these combinations: morphine and scopolamin, with magnesium sulphate and morphine, and even Gwathmey's formula can be used with sodium amytal, giving sodium amytal in the first stage and later giving four ounces of Gwathmey's formula. Patients do not tolerate chloroform anesthesia under sodium amytal. The respiratory centers seem to be disturbed by the sodium amytal, so that in the second stage we have to use ether.

Dr. Hobbs (closing).—I have had no experience in using sodium amytal in obstetrics intravenously. I have had some experience in using it orally. Also, I have had some experience with sodium amytal on the surgical service in Barnes Hospital. We use it intravenously as a preoperative anesthetic, but I observed one patient who died after 2 c. c. had been injected. A complete post mortem was held, and following a symposium of the various departments in conjunction with the pharmacological department, it was the consensus of opinion that the fatality was due to the sodium amytal, and that sodium amytal given intravenously is a dangerous drug. Therefore, sodium amytal administered intravenously is almost taboo in the Barnes Hospital group. We find that when given orally, it is no better than pyramidon, allonal, or codein with aspirin.

If Dr. Pride will remember, I stated in my paper that we start the injection as soon as the contractions become painful, and in this series of cases we found in the primiparae the average dilatation was around two fingers, and in the multiparae around three fingers. This drug can be given very early.

All of the barbituric acid series decrease the contractility of all smooth muscles, that is, in laboratory animals. We have seen the contractions slow down in a few cases, but the majority of our cases have had a rapid labor. I do not know the explanation. It has been suggested that there might be some relaxing effect on the cervix. However, this is problematical.

Dr. McCord called my attention to one thing that I should correct, and that is that a good many of our cases, primiparae especially, were delivered with forceps, and of course that would definitely cut down the duration of labor, but time and time again we have seen multiparae with three fingers dilatation be delivered within thirty minutes following the injection.

We have not had to restrain any of our patients, either before or after delivery. We have not had the experience of having our patints get out of bed, as has been reported after using sodium amytal. Neither have we noticed any of the toxic symptoms of the barbituric acid derivatives, such as vertigo, gingivitis, or rash. About the only symptom we have noticed after delivery is that many patients complain of slight dimness of vision; but that passes off very rapidly, and we have seen no bad results.

IS ORGANOTHERAPY OF REAL VALUE IN THE TREATMENT OF FUNCTIONAL DISTURBANCES OF THE REPRODUCTIVE ORGANS OF WOMEN?*

By Emil Novak, M.D.,
Baltimore, Md.

No branch of clinical medicine makes more points of contact with endocrinology than does gynecology, and none better illustrates the transition from the early speculative era to the more recent scientific one.

Ovarian therapy began its turbulent career in 1896 at the Landau Clinic in Berlin. It may be stressed that at this time it was not known that the ovary even possesses an endocrine function, and that this is responsible for menstruation. This discovery did not come until several years later. The plan of feeding ovarian substance to patients with supposed ovarian deficiency owes its inception merely to an assumed analogy with the thyroid and its disorders. Since Murray and others, some years previously, had demonstrated brilliant results from the feeding of thyroid in cases of thyroid deficiency, why would not ovarian feeding be equally efficacious in the treatment of ovarian deficiency? It was on just such speculative grounds that ovarian therapy was inaugurated.

The discovery of the important endocrine function of the corpus luteum by Fraenkel in 1903 set gynecologists off on a new scent. Since then many millions of corpus luteum tablets have been consumed by patient womankind, as have also huge quantities of ovarian tablets. Clinicians have always, in their therapeutic efforts, been inclined to keep just a few jumps ahead of demonstrated fact.

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It is now definitely established that the ovary produces two internal secretions concerned with the reproductive cycle. One emanates from the growing follicle, is called folliculin or theelin, and is responsible for the first or proliferative phase of endometrial development, that is, the period extending from the end of the menstrual period to about the mid-interval phase, at which time ovulation occurs. The second hormone, progestin, emanates from the corpus luteum. It begins its effect upon the endometrium after ovulation, carrying the uterine mucosa through the so-called secretory or pro-gravid phase, which reaches its acme just before the onset of the next period.

Folliculin alone is not capable of producing in the endometrium of either the human or the lower animals the complete series of changes seen during the menstrual cycle. It can produce estrus in the lower animals, for the ordinary non-fertile sex cycle in these is completely under the control of the follicle, the corpus luteum playing no part until after fertilization of the egg. To apply these statements to the human, folliculin (theelin) cannot produce all the endometrial changes essential for real menstruation. It can, however, reproduce the first or proliferative phase, and it can even, in a small minority of cases, produce bleeding. This, however, is not analogous to true menstruation, but rather to the estrus or proestrus bleeding seen in some of the lower animals. It is, of course, not preceded by the characteristic progravid hypertrophy of the endometrium seen before the appearance of the human menstrual hemorrhage.

Furthermore, and this is a fundamental point in organotherapy, practically all the available evidence indicates that the injection of even large amounts of theelin has no effect on the ovary, its action being apparently a purely substitutional one. To apply this fact clinically, one can see that even though, as sometimes happens, folliculin therapy is followed by bleeding, there is no reason to expect a periodic return of this hemorrhage, nor is one justified in considering it as real menstruation. Furthermore, ovulation is not in any way stimulated, so that there is no reason to expect benefit from folliculin therapy in sterility.

Theelin is a substance of undoubted physiological potency. It is now readily available commercially in definitely standardized form. It has even been isolated in a crystalline form of enormous potency. The unit of dosage is the rat unit, one unit being the smallest amount which when injected in a prescribed way into a castrated rat of standard weight will bring about the vaginal phenomena of estrus, the latter being readily demonstrable by the so-called Allen-Doisy vaginal smear test.

Theelin also possesses some potency when given by mouth, but the dose necessary is many times (variously estimated from ten to as much as a hundred) as large as that required for the hypodermic route. The latter is undoubtedly the method of choice, especially in view of the expensiveness of the substance. It may be added that none of the older commercial preparations for oral use (ovarian or corpus luteum tablets, capsules or powders) show any physiological activity when submitted to experimental tests such as those indicated above.

So far we have dealt only with the active principle of the ovarian follicle. What about the other ovarian factor concerned in the menstrual cycle, the hormone of the corpus luteum, or progestin? This has been isolated by Corner and Allen and its physiological properties satisfactorily determined. Unfortunately, it is not yet available in a form suitable for clinical use. However, efforts are being pushed along this line and are likely to be successful before very long.

Experimental studies indicate that progestin is concerned chiefly in the production of the progravid phase in the endometrium and in the implantation of the embryo in the early phase of pregnancy. Even when it becomes available for human use, it should be remembered that, like theelin, it exerts no stimulating effect upon ovarian function, and that its action, like that of theelin, would be merely a substitutional one. Moreover, it may be stressed, because of its clinical importance, that progestin can produce the progravid changes in the endometrium only when the latter has been previously primed, so to speak, with theelin. The application of this fact to the treatment of amenorrhea, for example, is obvious.

No consideration of the physiological factors in the reproductive cycle is complete without a reference to the dominating role of the anterior pituitary lobe over the ovaries and their two chief sex hormones, theelin and progestin. As I have reviewed this subject elsewhere, I need merely say that the anterior hypophysis, in addition to other functions, secretes two sex hormones which are responsible for the secretion and activation of theelin and progestin by the ovaries. One of these, spoken of as the follicle ripening hormone or prolan A, is responsible for follicle maturation and the activation of theelin.

The other, designated as the luteinizing hormone or prolan B, is concerned in the luteinization processes in the ovary and the production of progestin. There are of course still many controversial points as to the exact nature and mechanism of this pituitary control of ovarian function, but that it exists is demonstrated beyond all doubt.

Already at least one of these sex principles in the anterior hypophysis, the luteinizing factor, has been made available for clinical use. It is prepared from the urine of pregnant women, for it is well known that the urine, especially in early pregnancy, is very rich in these pituitary sex hormones. On this fact, of course, is based the well-known Aschheim-Zondek test of pregnancy as well as the Friedman and Brouha tests.

The availability of the luteinizing hormone is of great importance, especially since we do not as yet have the ovarian progestin for clinical use. Since the luteinizing pituitary hormone, however, is the underlying factor responsible for the production of progestin, one may reasonably expect that its administration would stimulate the ovary to form its own progestin. This assumption, as will be seen, has already been put to clinical use.

Some Clinical Applications.—The physiological considerations so briefly sketched may make more intelligible an equally sketchy outline of a few clinical applications of these endocrinological principles.

First of all, it may be stated that, in general, the various older commercial preparations of the ovary or corpus luteum, formerly widely used, produce no objective results whatever, and that their subjective effects are very questionable, to say the least. To translate this, there is no worthwhile evidence that they can produce menstruation in cases of amenorrhea, and none that they are of value in sterility, dysmenorrhea, or any of the many other indications for which they have been recommended. There are many excellent clinicians who sincerely believe that the oral use of such preparations is of value in the subjective symptoms of the menopause.

This is not an easy question to evaluate, because of the difficulty in eliminating the psychic factor, and because of the well-known variations in different women, and in the same woman at different times, in the severity of the menopausal symptoms. Skeptical as many of us now are on this point, there can be little quarrel with those who use this method of treatment, since, whether through psychic channels or otherwise, patients often report improvement, and since other methods of treatment of menopausal symptoms are rarely any more successful than this.

Moreover, from what has already been said, no amount of theelin can produce the complete endometrial cycle. Its use, therefore, should be followed by the administration of progestin for reasons already indicated. This alone would reproduce physiological conditions. As progestin is not yet available, I have personally been using in its place the anterior pituitary luteinizing substance, supplied through the courtesy of the Department of Experimental Medicine of Parke, Davis & Co. It is hoped that this will soon be available commercially.

By such methods as these a certain proportion, though not the majority, of women can be made to menstruate. Unfortunately, the function rarely returns with any degree of periodicity, so that it is usually necessary to go through with this long course of hypodermic treatment each month. There are very few women who will display any great enthusiasm over such a prospect, especially when it is explained that amenorrhea in itself is harmless, and that, in the case of the often associated sterility, there is no enhancement of the patient's chances for pregnancy by such treatment.

Theelin is frequently of value in the treatment of the severe nervous and vasomotor menopausal symptoms seen in some women. In many women little disturbance is produced by the menopause; in some there is moderate discomfort, and in a few the symptoms, especially the characteristic vasomotor flushes, are so frequent and so severe as to make the patient quite miserable. In such cases the oral administration of corpus luteum or ovarian extracts is often of little help, and better results are not infrequently obtained from the hypodermic use of theelin. An occasional course of six or eight injections of 50 units each, given on successive or on alternate days, will often prove of value.

An extremely important indication for the use of progestin, or of the anterior pituitary luteinizing substance, is in the treatment of a type of menstrual disorder which is characterized chiefly by an absence of corpus lutea and pro-

gestin. I refer to so-called functional uterine hemorrhage, common in women of middle life, though often seen in younger patients, and not infrequently in girls at or near the age of puberty. Progestin, were it available, would be a logical treatment, but since it is not to be had, it occurred to me that the anterior pituitary luteinizing hormone might offer a satisfactory substitute. This has apparently been borne out, as shown in the report of a large series of cases by Hurd and myself in a recently published paper.

This method of treatment bids fair to be of great value in the management of these exceedingly frequent and troublesome cases, especially in young women in whom preservation of the reproductive function is important. It will save many of these from repeated curettage or from radiotherapy, which should be a method of last resort in young women because of the danger of permanent sterilization. For the details of this new plan of treatment the reader is referred to our original paper.

There are, of course, many other conditions in which ovarian therapy has been employed, but those already mentioned are the most commonly encountered. The results in such conditions as sterility and dysmenorrhea have thus far been negligible. With regard to the latter and, more particularly, the common type spoken of as primary, there is reason to believe that endocrinology may soon offer an effective treatment. This would be an inestimable boon, for no gynecological disorder causes a greater aggregate of suffering than this troublesome menstrual or premenstrual pain which affects many girls and young women. We are now studying this problem on the basis of recent physiological investigations and hope soon to be able to report upon a method of treatment which has already given us gratifying results.

DISCUSSION (*Abstract*)

Dr. H. Vernon Sims, New Orleans, La.—What is your opinion of the use of vaginal suppositories in amenorrhea?

Dr. Novak.—Theelin is undoubtedly absorbed through the vagina, although two or three times the hypodermic dose is necessary. In view of the limited effects of even the latter method the vaginal route rarely yields striking results. Though it has some disadvantages, it is preferred by some patients to the method of hypodermic administration.

THE FEMALE URETER*

A NEW FACTOR IN THE INFECTIONS OF THE KIDNEY PELVIS IN WOMEN AND CHILDREN

By A. I. Folsom, M.D.,
Dallas, Tex.

It has long been recognized that inflammatory conditions in the glands surrounding the posterior urethra in the male have played an important etiological role in the infections of the upper urinary tract. Prostatitis and seminal vesiculitis have been looked upon as the submarine base from which the ureter and kidney have been involved in a variety of inflammatory changes.

Von Lichtenberg, in the Guiterras Lecture, delivered at the Seattle meeting of the American Medical Association, coined a very apt term to indicate the correlation. He used the term *system pathology* and insisted that in many cases of upper urinary tract infection the underlying cause was an adnexal infection, and that we should more and more come to consider the inflammatory conditions of the upper and lower urinary tract as a unit.

But in this discussion the prostate and seminal vesicles have alone been considered as foci from which upper urinary tract infection arose, and it is my purpose in this paper to call attention to a group of glands situated around the posterior portion of the female urethra; to show that these glands do become infected and do harbor the infection for years; and that this group of infected glands acts as a focus of infection from which the upper urinary tract can and does become infected.

Skenes' original contribution to the anatomy of the female urethra so focused our attention on the paraurethral ducts now bearing his name that we have assumed the remainder of this rather insignificant tube to be free from structures worthy of serious consideration. In fact, the texts of anatomy and pathology pass over this structure so hurriedly that one is startled by their meager details.

I have, for many years, had my attention called again and again to the posterior part of the female urethra as a hot bed of pathological changes in the mucous membrane and wall of the

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*From the Department of Urology, Baylor University Medical School.

urethra. I have seen not only the classical strictures of these tubes, but I have seen, in case after case, an interesting panorama of inflammatory lesions in this part of the urethra. These have been observed by the close vision cystourethroscope of McCarthy and have varied from a mild granular urethritis on through the varying stages up to and including well developed masses of tissue springing from the mucosa in the posterior half of the urethra. These masses vary in size and shape very widely: some are very fine fronds that move in the ingoing irrigating fluid like moss in a brook; others are small dentate elevations that give the margin of the sphincter the appearance of a saw-tooth edge; still others are sessile masses of tissue with a well defined vascular loop (its convexity always being toward the bladder). Still others are pedunculated masses of tissue, smooth in appearance and capable of being moved around by a projecting ureteral catheter.

I have observed these pathological changes under varying conditions. At times they are quiescent and appear simply as I have described them, but again I have seen this area when it had all of the characteristic appearance of an acute inflammatory process in addition. At these times the whole mucosa is brilliantly red and angry and small punctate spots can be seen. These seem to me to be exuding a whitish mucopurulent material, just as is seen from gland ducts in the male urethra, and this acute inflammatory addendum may be limited to the urethra or it may be associated with an inflammatory appearance over the bladder mucosa.

From these oft-observed facts I have for several years been convinced, from a purely clinical viewpoint, that there must be some underlying cause for the changes in this area. This conviction stimulated a careful anatomical and pathological study which has been undertaken by Dr. George T. Caldwell, Professor of Pathology of Baylor Medical College, and the author, partial results of which have been reported in the *Journal of the American Medical Association* of November 7, 1931.

From these studies it seems that there exists a group of gland structures surrounding the posterior part of the female urethra: distinct, definite gland structures, not simply mucous crypts, but glands that extend into the muscularis. Some seem to be of the branched tubular variety.

These glands we have found in a large number of anatomical and post mortem specimens, showing varying degrees of inflammatory changes. Some have had their ducts closed and the retained secretion had given them a cystic appearance on section.

An interesting observation has been that these glands are quite variable in size, distribution and arrangement, so that while we feel there is a close resemblance to the prostatic gland and seminal vesicles in the male, yet we must say they are rudimentary in comparison to these well formed structures. Nevertheless, they do exist as distinct structures capable of becoming infected or harboring that infection over a long period of time.

In other words, it is our belief that this group of rudimentary glands, situated around the posterior female urethra and opening into it, constitutes a definite focus of infection and as such should be studied most carefully. It is a well-known biological fact that rudimentary structures, such as the appendix, are capable of more harm than the more highly organized and better developed organs.

If these premises are correct, namely: that there does exist this group of glands and that they do become infected, one sees at once how intimately related some of the upper urinary tract infections in women may be to this new focus of infection.

I should like to detail a few clinical observations I have made in this connection.

First, we have long looked for an intelligent reason why about ten girl babies should have pyelitis to one boy baby. With the existence of this group of glands established, we have at once a ready reason for the disparity. The relatively short and more or less open female urethra, being bathed by fecal matter and urine during infancy, can easily, and does, become the host of this contaminating material. Now, this fact would mean nothing if the urethral mucous membrane were a glandless membrane, for the recurring irrigations of the urinary act would protect the tissues here as it does higher up, but once this contaminating material succeeds in infecting the glands I have described, then we have another story; for, protected here from the onrushing torrents of the urinary stream, the infection becomes lodged and takes up a more or less permanent home. This same process can not nearly so easily occur in the infantile prostate and vesicles, because they are protected by a much longer and better guarded channel.

Second, I am sure it has been the experience of many urologists, as it has been mine, that

many times we are presented with a case of perfectly typical pyelitis in a girl baby. The picture, from a clinical standpoint, is complete: fever, pus in the bladder urine, and everything else negative. We have cystoscoped these cases, catheterized both ureters, and have been much surprised to find the urine from both kidneys entirely negative; or if, because of some localizing symptom, only one ureter has been catheterized and the urine has been reported negative, both cytologically and culturally, we have been surprised at these negative findings, but we have been still more surprised that the child should immediately improve, the fever subside and the urine clear up. In such cases we have shrugged our shoulders and wondered, as in the words of the Mexican when he says, "kien sabe."

Now what happened here, in my judgment, is that we were not dealing with a pyelitis at all, but were dealing with an acute inflammatory reaction in this group of glands around the posterior part of the urethra. The pus arising from these glands passed back into the bladder and showed as a cloudy urine, because the female urethra has an external and internal sphincter, just as the male. When we passed the cystoscope into the bladder we dilated the ducts of these little glands, and in that way promoted their drainage, and as a result of the urethral dilatation, and not the pelvic lavage, these children were relieved. I have not seen one, but many cases just as I have detailed above, and my conviction is that many of our so-called cases of pyelitis in girl babies are not a pyelitis at all, but a posterior urethritis instead.

One of the most striking cases in my series showing this febrile picture resembling a frank pyelitis, occurred in the three months old daughter of one of our local physicians. The child cried and strained at each urination and had fever ranging from 103 to 104°. The urine was found to be heavily loaded with pus. The child's general condition seemed to be good, as is characteristic of pyelitis in children, and nothing else could be found after a prominent pediatrician had examined the child carefully.

The cystoscopic examination showed, first of all, a definitely tight and what seemed to be a rigid urethra. The bladder wall was grossly trabeculated, although not actually inflamed. The posterior part of the urethra and sphincter margin were seen to be quite irregular and granular.

Each ureter was catheterized in turn and nothing found from either kidney. The urine showed no pus at all and only an occasional blood cell (traumatic). A 0.5 per cent mercurochrome solution was instilled into each pelvis in spite of the negative findings.

Following this the child was improved, temperature remained normal for two or three days and there was less pain on voiding. Then the picture returned, of fever, pain on voiding, and so on. A simple urethral dilatation was done this time with equally satisfactory results. She remained free of fever again for four days. Fever then returned, but each time was relieved by urethral dilatations and medication. After several such experiences we decided to check our original observations and again catheterized the ureters and again found normal urine from both kidneys.

By gradual dilatations of the urethra we were able completely to eradicate her fever and clear up her urine.

She now seems perfectly well, she has no trouble voiding, no fever and has had no pus in the urine now for several months.

I think we would have to be skeptical indeed to fail to agree to the conclusion in this case that we were very probably dealing with a focus of acute inflammatory reaction in the urethral glands, analogous in all its details to an acute prostatitis.

Third, soon, however, the lymphatics draining this area pick up this infection and, passing it along under the trigone, present it to the ureteral lymphatics and it then passes up and produces a frank pyelitis. Sometimes we have a pyelitis and an acute posterior urethritis in the same case. There seems to me no question that once this group of glands becomes infected it becomes a submarine base from which cargo after cargo of infection may be passed along over the tract to the pelvis of the kidney, and even in cases of pyelitis that have been cured by lavage and medication, we can understand how it could again become infected from this focus at the neck of the bladder.

This is probably one of the reasons why chronic or recurring pyelitis is so hard to cure. We have been able to cure those cases produced by infections of the tonsils and teeth by attention to those foci, but we have been blind to a potent focus nearer home and these are the cases, in my judgment, that have resisted all our blandishments and have been the *bete noir* of our specialty.

There are two factors upon which I have based the foregoing suggested relationship. First of all I have observed, as I am sure you have, in many women, a distinctly marked red band extending across the trigone from the internal urethral opening to one or the other of the two ureteral openings. This band is so well marked as to be conspicuous, and it shows in addition to a diffuse red background a network of engorged, congested vessels that may be seen as a network covering this area. In some, this band will surround the ureteral opening in its terminus. In some, there may be two such

bands, one leading to one ureteral opening and one leading to the other. The condition that I am describing is distinctly different from the diffuse redness that sometimes spreads over the trigone as an extension of the inflammation in the urethral area. The process seems to be definitely a submucosal process and, in my opinion, it represents a more or less well developed lymphangitis extending along the subtrigonal lymphatics, and is probably the path through which the infection is conveyed from this focus in the urethra up to the pelvis of the kidney. There is a well recognized connection of the lymphatics from this area of the urethra under the trigone with the ureteral lymphatics which in turn connect very intimately with the lymphatics of the kidney above.

I have seen this red band clear up on treating the posterior urethra and pyelitis, and have seen it reappear at times in varying arrangements.

The second thing that has forced me to a belief that this focus in the glands around the urethra plays a causal role in recurring pyelitis is the fact that cases of hitherto resistant pyelitis have been cleared up by correcting this pathological condition in the posterior urethra. I have seen many cases respond after they were relieved of this posterior urethral focus, just as we all have seen cases that have been irrigated and dilated without benefit, clear up after the removal of an abscessed tooth, tonsils or attention to an old prostatic infection.

I shall not burden you with a recital of cases, save one that has been to me a most convincing one.

Mrs. N., age 48, first came for pain in the right loin, and bladder irritation, with no history of fever. A small hypoplastic kidney was found and removed, with excellent results. The pain in the loin was entirely relieved, but two years later she returned for a recurring bladder irritation. The urine was negative, as it had been at time of operation. Cystourethroscopy was done and a urethra that was narrowed to a 22 F. was found. The urethra was grossly pathological. Many polypoid masses could be seen. As the bladder was negative and the urine uninfected, I did not catheterize the remaining kidney. An indigo carmine test at the time of operation and again at subsequent examination was normal.

I advised dilatations of the urethra and fulguration of the masses. This was done and following the first fulguration she had a rather severe reaction, associated with fever and pain in the remaining kidney, identical to the reactions we see in men following an instrumentation of the posterior urethra. Pus appeared in her urine and subsequent catheterization of the kidney was done after urotropin had been used to control an evident acute pyelitis. Pus was found in the kidney urine, but a prompt subsidence of the acute picture followed the pelvic lavage.

The patient stoutly refused to have any other treatment and returned home. For a year she continued to have recurring attacks of acute pyelitis which we treated by pelvic lavage, urotropin, neoarsphenamine, injections and other means.

Finally, after one and a half years of this, she agreed to a continuation of the urethral treatment, and much to her chagrin and my delight, her whole clinical picture began to change. Without any further pelvic lavage but simply following dilatations of the urethra, with increasingly large sounds, she has remained free from recurrence of her pyelitis, her urine has gradually cleared and her entire condition has improved.

In this case I think the stimulation and trauma of the posterior urethra relighted or activated the focus of infection and a pyelitis resulted either *de nouveaux* or as a relighting of an old long quiet process.

So firmly am I convinced of the value of the treatment of the urethra along with the treatment of recurring pyelitis that I have for a number of years made it a routine part of our office procedure.

Let me, however, hasten to say that even with this added detail of treatment there are occasional resistant cases, for we have no guarantee of our ability completely to rid these urethras of a long harbored infection. Attention to this focus will add many cases to our list of cured.

DISCUSSION (*Abstract*)

Dr. W. L. Grantham, Asheville, N. C.—We have all seen patients who complained of frequency, burning, and every symptom of acute cystitis, with perfectly clear urine. We have seen them improve after a cystoscopy and ureteral catheterization, although we found no disease pathology in either kidney. I have recently had three cases of this type.

I am not able to discuss intelligently infections of the kidney pelvis in women and children from the female urethra. When we study the anatomy of the urethra and note the number of glands present, as shown by Dr. Folsom, I do not see why infections would not come from this source.

Dr. C. W. Shropshire, Birmingham, Ala.—We have all treated a number of females, infants and adults, with infection of the urological tract which improved after dilatation of the urethra either with urethral sounds or the simple passage of the cystoscope.

I have found such conditions in the posterior urethra as Dr. Folsom describes.

Dr. H. W. E. Walther, New Orleans, La.—Dr. Folsom has made the important discovery of a new focus of

infection in the deep urethra of the female. I trust he will continue his work and give us more of his results in the years to come.

Dr. Julius Frischer, Kansas City, Mo.—In conjunction with this infection of the posterior urethra, I wish to call to your attention the persistent caruncle in women. In *Surgery Gynecology and Obstetrics*, numerous investigations have been reported by men who have found urethral caruncle to be an inflammatory process. In our clinic, we have examined about 50 patients with urethral caruncle. These have been thoroughly investigated and all had infection in the upper urinary tract, accompanying the local condition. Whether it was ascending or descending is a question, but we are absolutely certain that infection was present in all cases. Local treatment of the urethra as described by Dr. Folsom, and treatment of the source of the infection, has given us satisfactory results.

Dr. Edgar G. Ballenger, Atlanta, Ga.—Dr. Folsom has explained something we have noted for several years, namely: that in women who have persisting gonorrheal infection, the site from which organisms may be obtained most frequently is the urethra. Formerly we had thought that a smear from the cervix was the most likely one to show gonococci. It has been a great surprise to find how consistently the organisms can be found in the small amount of secretion expressed, by fairly firm pressure, from the female patient with chronic gonorrhea.

A most discouraging feature of such tests is that the organisms will often be found in patients who appear to be well and ready for dismissal. Treatment for eradication of gonococci in such foci is also most discouraging. There may be no symptoms directing attention to these foci, and coitus will often fail to transfer infection.

Undoubtedly urethral strictures develop, at times, in the region of these persisting foci. They are, furthermore, greatly neglected.

It has been a pleasant surprise to see how frequently patients without gonorrhea, but with frequency, dysuria and the symptoms attributed ordinarily to trigonitis, have been cured by urethral dilatation with sounds. These instruments are allowed to remain in the urethra 10 to 20 minutes and the treatments are repeated about once a week.

The excellent pioneer investigation of Dr. Folsom has helped to explain why infection and irritation persist in this neglected area, the female urethra.

Dr. W. J. Wallace, Oklahoma City, Okla.—I wish to ask Dr. Folsom about the etiology of these cases. Was the infection due to some specific organism or conveyed by the hematogenous route?

Dr. Folsom (closing.)—I have not yet had an opportunity to make a definite study of the bacteriology of these cases. That is a problem we are looking forward to. I imagine that many cases are gonococcal but many are not, and I believe that probably a majority will be found to be non-specific in character. Many of the earlier cases will be non-specific.

VOIDING DISTANCE DECREASE AN IMPORTANT EARLY SYMPTOM OF PROSTATIC OBSTRUCTION*

By EDGAR G. BALLENGER, M.D., F.A.C.S.,
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and
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The advent of cystoscopic resection of obstructing prostatic tissue by means of the high frequency cutting current has made early recognition of vesical neck obstruction desirable.

As long as prostatectomy was the only dependable measure for relief of prostatic hypertrophy, early diagnosis was not of great importance because the formidable character of this operation caused its postponement until well marked symptoms required intervention. The situation is now reversed and early diagnosis has become important in order to prevent the occurrence of troubles requiring a major operation. While difficult voiding, frequency during the latter part of the night and difficulty in starting the urinary stream are significant, there is still another reliable symptom which appears early, namely, a decrease in the voiding distance, that is, the distance the urinary stream can be thrown. Naturally this varies greatly in different individuals according to the size of the meatus, the caliber of the urethra and other factors. The significant point, however, for each patient is not the comparison of his voiding distance with the average of others, but with his own past performances. If a man fifty years of age notices that the distance he can void has definitely decreased during preceding months, this fact should lead to an examination to find the reason for this decrease.

In no branch of medicine is there a greater opportunity for the prevention of serious disabilities than is now afforded in urology by early recognition of prostatic obstructions. This can be accomplished by advising men forty-five or fifty years of age to make a test, from time to time, preferably when alone in the country or out by the barn, to determine what is the best average distance the urine can be voided with a full bladder. In later years, when the urinary stream is found to be definitely decreased, say to one-third or one-half the former average, an

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examination should be required. Heretofore, the early symptoms of prostatic obstruction were minimized or disregarded because they did not justify prostatectomy. Now since it is possible to arrest the obstructing process by cystoscopic resection and prevent a major operation, recognition of the early symptoms becomes essential. The voiding distance test enables a patient to repeat, from time to time, a test which can be interpreted by actual measurement. The simplicity and reliability of this test as a guide make it, we think, well worth while.

SPINDLE CELLED SARCOMA OF THE BLADDER WITH A REPORT OF ONE CASE*

By Fred K. Garvey, M.D.,
and
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Tumors of connective tissue origin in the bladder rarely occur. Of these, sarcoma probably is the most frequent. Yet in carefully searching the literature one finds less than 100 cases reported. The rarity of the condition is more striking when in reviewing the literature it is noted that few physicians have reported single cases and very few as many as two cases. Most authors on bladder tumors merely mention sarcoma in classifying malignant growths, but in their discussion on diagnosis and management of malignant tumors of the bladder limit themselves to those of epithelial origin. This occurs presumably because probably 90 to 95 per cent of bladder tumors are of the epithelial type. Consequently little is known or has been done about sarcoma.

Mention is made by most authors of the different types of sarcoma, namely, spindle cell, small and large round cell. Most of the cases reported were the small round cell, though it is believed by some that the majority are of the mixed cell type. So far we have been unable to find a single report of a spindle cell sarcoma of the bladder. Whether the condition is so extremely rare as this, or whether cases have been seen that were merely classified as sarcoma, we are unable to determine.

In 1922, Scholl reported from the Mayo Clinic one case of sarcoma in 262 cases of bladder tumor. Geraghty in 1924 reported two cases from 180 tumors. Gardner in 1916 reported seven cases out of 1,702 bladder tumors. McKenzie, out of a series of 285 tumors, reported one case. Deming, up to the present date, has collected 66 cases of infantile bladder tumors, only 35 of which were true sarcoma. He suggests that he may have missed a few, but thinks that of the 97 reported by one author, "In some instances the same case may have been reported by different authors at different times and counted as different cases."

Regarding the incidence as to sex the majority occur in the male. In children the ratio is about two males to one female. In adults it is about five to one.

The age incidence varies somewhat according to sex. Generally speaking, the majority occur in the first decade and most of these before the fifth year. In McKenzie's list of cases we find in the first decade mostly females, while the majority of the males are in the fourth and fifth decades. Of 51 cases reported by Albarran, only seven were found in the first decade. However, Deming, in a series of 37 sarcomata, found the majority before the fifth year.

CASE REPORT

F. S., female, age 13, was admitted April 18, 1931, complaining of bloody, frequent and painful urination, without difficulty, of four weeks' duration. These symptoms increased in severity and were later accompanied by great difficulty. Two days before admission she passed bright blood with clots, which the family thought was menstrual. She had no pain elsewhere except slight backache at times.

She had had the usual diseases of childhood, also pneumonia. She had menstruated for the previous four months at regular intervals.

Her father and mother were living and well. There was no family history of tumors.

She was well developed and well nourished, though slightly anemic in appearance. Nothing abnormal was encountered on general physical examination except the following: there was some tenderness and voluntary rigidity over the bladder region and a bloody discharge over the vulva with a small polypoid mass protruding from the urethra. There was no glandular enlargement and no costovertebral tenderness. Her temperature was 92°, pulse 122, and respiratory rate 22. The blood picture showed 26,000 white blood cells with 21 per cent neutrophils. The urinalysis showed 3+ albumin with an abundance of red blood cells. No x-ray was taken. A cystoscopy was attempted, but unsuccessfully on account of a large mass which filled the bladder.

A suprapubic cystotomy was done under ether anesthesia. Almost entirely filling the bladder was a large necrotic mass which appeared to be grape-like or papillary in parts, but so degenerated that it resemb'ed jelly. It appeared to arise from the base covering the trigone and invading the urethra and lateral walls of the bladder. Several pieces were removed for biopsy

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and the bladder was closed after inserting a pezzar catheter. The patient left the hospital on the fourth day with her condition unchanged.

The pathologic report was as follows: "Sections consist of an aggregation of spindle shaped cells resembling somewhat young fibroblasts. These vary somewhat in length, but, on the whole, are shorter than the cells of which a fibroma is composed. Each possesses a large, well stained, oval or red shaped nucleus contained within a somewhat faintly stained cystoplasm. The individual cells are separated from one another by a scanty matrix. These tumor cells are more or less distinctly arranged, being parallel to one another, and in bundles which run in different directions and interlace with one another. Consequently, in the sections, the cells are not all cut at exactly the same shape. Those cut at right angles appear round and some of these do not show any nucleus. Those cut obliquely appear oval, while the remainder, cut in the long axis of the cell, present the typical spindle shape. Many of the nuclei show mitotic figures or other evidence of division. Among these masses of cells cleft-like spaces with a delicate endothelial wall are observed. Diagnosis: small spindle cell sarcoma."

The patient died November 4, 1931, seven months later, at which time she had become very emaciated, and suffered marked bladder pain which required large amounts of morphine to relieve. The growth had extended through the line of incision, reaching the size of a grapefruit. Large hematomas developed with breaking down and sloughing of the wound. There was also extension along the urethra to the external genitalia, where marked sloughing of the parts occurred. No autopsy was done and further metastasis was not determined.

The location of bladder sarcomas is usually on the trigone, though they may involve any portion of the bladder. In one form there is a widespread and diffuse infiltration of all the coats of the bladder, while in the other form there is present a single or multiple nodular mass or grape-like clusters of tumors. Either type tends to fill the bladder lumen. Caulk states that "the great selectivity of sarcomatous tumors of the bladder to the trigone and at its juncture with the bladder base in all probability has a great deal to do with the faulty seam of fusion of the two fetal surfaces and the mesodermal origin of the trigone."

Symptoms.—The symptoms are not different from those of any other malignant tumor of the bladder. Deming states that the initial symptom of sarcoma is not so likely to be hematuria as in epithelial tumors. The clinical picture is usually hematuria, pain, and disturbance of urination. There may be marked difficulty when the growth invades the urethra, as it did in our case, in which a polypoid tumor was protruding from the meatus. Pain and other urinary symptoms depend on the form, size, and location of the growth. Naturally they are more marked if the tumor is situated on the trigone.

Diagnosis.—Where there is a protrusion of or passage of tumor through the urethra, the diagnosis is less difficult. Urinary symptoms plus the presence of a mass in the bladder region are suggestive of bladder tumor, but occasionally the tumor proves to be only a bladder distended with urine. The cystoscope is our best means of diagnosis, yet in many instances a suprapubic cystotomy is necessary on account of the size and degenerated condition of the tumor.

Course.—The prognosis is fatal in nearly all cases of true sarcoma. Only one case, that of Geraghty, can be classified as cured. Operative relief is practically futile. One polypoid sarcoma was reported cured by Klein. Also one fibrosarcoma was reported cured by Deschamps. In Deming's collection of cases from the literature only 9 per cent of all forms of bladder tumors in the first decade were cured. Of these none was sarcoma. Early metastasis to the adjacent lymph nodes may occur, but remote metastasis is late.

The method of treatment depends on the location, size and extent of bladder involvement and also upon whether metastasis has occurred. Many methods have been used, all of which are of doubtful value, namely, ligation and excision, resection, diathermy, radium and x-ray. However, little work has been done with the use of the last three named. Albarran and Darling suggest total cystectomy. The only case of cure on record is where an early diagnosis was made and radical excision was performed. That gives us some hope that if these cases, particularly those where the tumor is located on the wall of the bladder, can be gotten sufficiently early and excision can be done, following this by massive doses of x-ray or radium, we may make the picture less grave.

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SYMPTOMATOLOGY OF MASTOIDITIS*

INDIVIDUAL ANATOMICAL AND HISTOPATHOLOGIC VARIATIONS

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INTRODUCTION

It is not my intention to present in this paper a systematic rehash of the classical signs and symptoms of mastoiditis; nor shall I make an attempt to formulate set rules as to when we shall treat this disease conservatively and when we shall operate. I wish only to emphasize the necessity of considering each case a law unto itself and of establishing our diagnosis and regulating our treatment upon individual and specific indications.

It is to be assumed, of course, that cumulative knowledge, acquired from observation and care of many of these infections, and constant familiarity with the best of clinical and research literature, has developed and ripened our ability and discretion so that we may always be able to visualize a composite and comparative image of what is probably going on in any given instance; but unless we can apply this learning, and also keep the picture that each patient presents uppermost, clear-cut and separate, our experience, as Hippocrates warned us long ago, is bound to become fallacious and our judgment increasingly difficult.

THE ANATOMICAL ASPECT

The essential diagnosis of mastoiditis should never be especially enigmatical, for every acute pyogenic infection of the tympanic cavity includes all of its potentialities. The fact that by far the greater number of these very frequent infections recover with or without adequate treatment, and with little or no evidence of mastoid inclusion, has given rise to a classification of suppurative middle-ear disease which is clinically tenable, but anatomically and pathologically a distinction without a difference. Acute purulent otitis media and mastoiditis are not separate entities, but simply stages in an inflammatory invasion of the mucous membrane lined air spaces of the petrous and mastoid portion of the temporal bone. Careful consideration of this cell structure alone must teach one that mastoiditis is a disease whose rather simple pathology is largely influenced by the anatomy of the part involved, whose histopathological gradations may be, for similar reasons, both numerous and variable and whose symptomatology can reflect the reaction of this type of tissues to an invading organism with either negligible mildness or intense virulence.

Accurate anatomical knowledge, therefore, concerning the whole temporal bone, its structures and its surroundings is very clearly the first absolute requisite in every diagnostic study. Our anatomical conception naturally begins with the axiom that the Eustachian tube, the tympanum and the mastoid antrum must be considered as one cavity, lined with mucous membrane continuous with that of the pharynx into which it opens. We know that the tympanic cavity and the mastoid antrum are laid down embryologically together, that they are practically the same size at birth as in adult life, and that they always communicate one with the other. This so-called middle ear cavity, however, is the only certain feature in the cellular structure of the temporal bone, though from it develops and with it communicates a system of air spaces so variable that they may be said to differ in every person from the very small mastoid process dense in structure, and showing no tendency to pneumatization to the very large and completely honeycombed type. These cells may extend deeply into the petrous portion almost surrounding the labyrinth and extending to the very tip of the petrous pyramid. They may permeate the tegmen tympani, surround the Eustachian tube and extend beneath the floor of the tympanic cavity, capping and encroaching upon the fossa for the jugular bulb. They may even extend forward into the zygoma and up into the squamous portion itself. They are always lined with mucous membranes and are continuous one with the other and with their parent cell, the mastoid antrum. They undergo variations perhaps throughout life, but by two years of age they have taken on more or less adult characteristics. In children their relative size and absorptive power in proportion to body weight is ten or fifteen times that of the adult. This is an extremely important fact to bear in mind when we are amazed at the profound constitutional reaction that these infections may occasion. We must also remember that no less authorities than Politzer and Whitmaak taught that the antrum is larger at birth than in the adult, that many have observed that the antrum is not always the only mastoid cell present at birth and all of us, I am sure, have found very

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well defined cell structure in infants under one year of age.

When attacked by disease this cell structure becomes a mass of broken down mucous membrane and bone tissue teeming with streptococci or some other pyogenic organism. Fortunately it most often remains confined by the cortex within the mastoid process itself, but it may spread to surrounding structures with most disastrous results. We must know, therefore, not only the pure anatomy of this cell structure, but the morbid anatomy as well, and to have a working idea of this it is necessary to understand the histopathology of the lining membrane of the cells and also the blood supply extension and spread of the inflammatory process. We cannot all do laboratory research, but we can be conversant with the work of others, and I particularly call your attention to a recent paper on histopathology by Bernard D. McMahon (*Annals of Otology, Rhinology and Laryngology*, March, 1931), which is most comprehensive, yet simple and logical and from which I freely quote:

McMahon believes that the lining membrane of the cells is of paramount importance in the spread of the infection. This membrane, he says, is composed of a tunica propria which is a sub-epithelial, rather loose areolar tissue containing a thick net work of thin walled capillaries. The character of the epithelial covering of the tunica propria varies in different locations, from the Eustachian tube where it is high columnar and ciliated to a single layer of flat epithelium in the remote cells. The bone is somewhat of the cartilagenous type and highly vascular and when infection occurs, the single layer endothelial walls of the capillaries are easily penetrated by the infecting organism which is thus carried very quickly into and along the tunica propria, and for this reason we find remote cells filled with pus while intervening ones remain more or less normal. Infection is carried into the bone in a similar manner, the capillaries extending into it directly from the tunica propria.

As McMahon points out,

"The extreme vascularity of the mucosa and bone of the mastoid, and the delicate-walled type of vessel form an ideal medium for rapid absorption of toxins even from such a relatively small area."

As a matter of fact, is this so small if we visualize the mucous lining of a large cellular type of mastoid spread out as a flat membrane?

We must remember also that the petro-squamosal suture is not closed much before two years of age and that this mucous lining of the cells is in direct communication with the dura through blood and lymph vessels, and that the blood vessels of the middle ear anastomose with those supplying the external ear and the labyrinth.

Much of this is trite and boresome; but it is the very groundwork of our knowledge concerning the pathology, diagnosis, symptomatology and treatment both medical and surgical of mastoiditis. We can, therefore, never know enough about the pure anatomy and histopathology of this complicated system of air spaces, and we should never miss an opportunity to study their ramifications and varieties, which can easily be done in the dried specimen, by roentgenograms and by observing not only the pathology, but the individual anatomy in each person upon whom we operate. We shall remember always that we are not simply opening and cleaning out an abscess in homogeneous tissue, but that we are really dissecting a physiological organ of the highest importance, surrounded by the most vital structures in the human body. I have never seen this better expressed than by Sir Charles Ballance in his "Surgery of the Temporal Bone."

"The temporal bone harbors the organ of hearing and that pertaining to equilibration. It is an intimate relationship with the cerebrum and cerebellum. It is traversed by, grooved for and in contact with the 5th, 7th, 8th, 9th, 10th and 11th cranial nerves. It is hollowed out for, and in close contact with the lateral, sigmoid, petrosal and cavernous sinuses, and the bulb of the internal jugular vein. It is tunnelled for the internal carotid artery, and like other bones it is permeated with a network of minute vessels. It contains a complicated system of cavities lined with mucous membrane continuous with that of the pharynx. No wonder then that grave and even fatal ill'ness should so often follow when the temporal bone is attacked by infective disease."

Could there be a better text than this to keep before us when we are dealing with an infected temporal bone? Why should we not, at times, expect to encounter meningitis, lateral sinus thrombosis and brain abscess, cerebral or cerebellum, irritation of the fifth nerve and paralysis of the sixth (Gradenigo's syndrome), functional disturbance of the seventh, eighth, and occasionally the ninth nerve? Lillie, of Rochester, has compiled a number of cases of cranial nerve involvement in a paper which is most interesting (*Trans. A.M.A.*, 1929). Crowe has exhibited a beautiful collection of specimens showing the pathway of infection in otitic meningitis (*Trans. American Otological Society*, 1928). Otologic literature is replete with articles demonstrating the anatomical basis of Gradenigo's syndrome (Kopetzky and Almon: *Annals of Otology, Rhinology and Laryngology*, December, 1930; Meltzer: *Trans. American Otological Society*, 1930; Profant: *Archives of Otology*, March, 1931.) And, of course, case reports of lateral sinus thrombosis and brain

abscess of otitic origin are found in nearly every medical journal we open.

THE CLINICAL ASPECT

Clinically, acute otitis media is one of the most prevalent diseases of childhood and not uncommon at any age. It is usually secondary to a tonsillitis, a nasopharyngitis or the common or "grippy" cold, which for brevity may be made to include every disease of the respiratory tract from rhinitis to lobar pneumonia. It is a frequent and potentially serious complication, for which we must always be on the lookout in scarlet fever, measles and influenza, in which diseases it occasions general reactions which simulate and must be differentiated from the toxemias of the general disease itself. It is always a direct infection through the Eustachian tube, whose shorter course, greater patency and more horizontal position in children predispose them to these invasions of pyogenic micro-organisms, usually a streptococcus. The great majority of these cases recover. They may be dismissed from the study of mastoiditis, but not without some thought. Many infections recover on account of the mild toxicity of the infecting organism, the resistance of tissue, the rapidity with which certain factors within the body concerning which we know little or nothing can build up both a local and general defense and that vague thing called immunity. The very anatomical construction favoring extension in one case prevents it in another. Pathologically there may be direct extension of pus from one cell to another in these cases without involvement of the blood vessels and areolar tissue of the mucous membrane, and there is time for a mechanical walling off by swelling, especially in the *aditus ad antrum*. We may only surmise these things, of course, but they seem to be exemplified in the type of infection which causes an initial flare up, with all the signs and symptoms both local and general of mastoiditis; but that subsides with a promptness for which we often get and graciously accept the credit. From these cases has also arisen a rule, applicable in many instances but exceedingly treacherous in others, that no mastoid operation must be performed until nature has had time to build up a local and general resistance, lest we open up new channels for fresh and more serious extension of the infection. This idea is so generally prevalent that one finds it expressed in practically every paper dealing with the clinical aspect of mastoiditis. It is probably safe when the otologist in charge is an expert diagnostician willing to practice eternal vigilance, but exceedingly hazardous when practised by the pediatrician or aurist who does not recognize the danger involved in waiting for a phase in a disease which has no accurate or clear-cut pathological or clinical basis.

In contrast to these somewhat alarming but rapidly subsiding middle ear inflammations are the cases which burst into flame from the moment of the primary invasion: the so-called hemorrhagic mastoiditis, due to a virulent type of hemolytic streptococcus, which the tissues and "nature" seem unable to combat. The onset is sudden and horribly painful. The otalgia is not relieved by the establishment of drainage from the tympanum. The discharge is profuse and serosanguinous. The mastoid region quickly becomes boggy and exquisitely tender. The temperature is high even in adults, general toxemia becomes apparent almost immediately and the prostration is profound. The involvement and destruction of the mastoid cell structure seems a matter of hours rather than of days, or weeks, and undoubtedly the extension of the infection is by way of the capillaries and the subepithelial areolar tissue of the mucous membrane and the capillaries of the bone rather than by direct extension from one cell to another.

I believe that these patients should be operated upon just as soon as we are sure that we are dealing with an infection of this high degree of virulency, and as a rule the picture is not difficult to evaluate. The extreme prostration, if nothing else, is indicative of what is going on. At operation the cell structure will be found reduced to a bleeding mass of broken down mucous membrane and bone tissue. The dura is often found exposed over the antral roof and the bony plate over the lateral sinus is necrotic. No matter how completely the cell structure is removed the inner cortex will still show marked congestion. I believe that the mastoidectomy must be as complete as possible, especially the opening of the antrum and its communicating cell and all cells over the region of the lateral sinus.

I admit the seriousness of the operation. No doubt we open fresh channels for infection, but on the other hand, I am thoroughly convinced that the prognosis is better, with establishment of drainage from the mastoid, than it is if we let a profoundly toxic patient try to fight out a battle against a focus of infection which is continually and repeatedly piling fuel on the fire.

Blood stream infections may occur extremely early in these cases. They do not indicate a thrombosis of the lateral sinus in the true sense of the word. The lateral sinus does not show the classical changes which we all know is a comparatively slow process. We may not be able to determine the portal of entry of the bacteria into the blood stream, but certainly there are pathways in abundance. Friesner, in a very recent article (*Archives of Otolaryngology*, Sept., 1931), says that transient septicemias, or better, bacteriemias, are much more common and less serious than we used to think them to be, and that many cases are on record of general blood stream infection in diseases of the ear without macroscopic or microscopic evidence of either lateral sinus phlebitis or thrombosis. It is the basis, of course, for the arguments recently appearing in the literature that ligation of the internal jugular is not necessary, unless a clot in the lateral sinus can be very definitely demonstrated. Undoubtedly surgery, other than the complete simple mastoidectomy, is meddlesome in the class of case under discussion.

The aftermath is bound to be stormy, and often indeed we must depend on the internist or the pediatrician for his advice regarding supporting treatment which includes diet, well regulated stimulants and blood transfusions. A number of these patients, especially children, cannot battle through. The majority, however, will recover, and there is no doubt in my mind that very early operation is not only logical but gives the patient the first and best chance. In meningeal invasions of otitic origin I have never seen a mastoidectomy help, though I have tried it, and probably will continue to try it.

Happily these cases are rare as compared to the ordinary slowly advancing type of mastoiditis with which we most frequently come in contact. I shall not weary you with any great elaboration concerning its signs and symptoms. First of all let us consider that when these infections occur they are a part rather than complication of all diseases in which the upper respiratory tract is involved. I do not like to state the time element, as important as it may be, in arbitrary terms of days or weeks, but every acute otitis media should be well, or so far on the road to recovery as to be negligible, within two weeks. Continuation of profuse discharge, fever sometimes during the twenty-four hours, and discomfort or slight tenderness after this time means mastoiditis. Of course many of these patients will recover without operation, but after two weeks we are in the danger zone.

Paradoxical as it may seem, the general practitioner and the pediatrician see more of these cases than we treat. There is nothing anomalous in this state of affairs, and for various, and particularly for economic reasons, it is not unreasonable. Truly the pediatrician is in a strategic position. He should know, and we want him to know, a great deal about ears, and we continually need his advice, but we do expect him to realize what is going on in an ear which is not getting well after a reasonable length of time.

Personally, my pediatric contacts have been most happy and I am eternally grateful; but I often wonder when I read the contributions with which pediatric literature fairly bristles whether otology has developed an inferiority complex because pediatrics is very sure of itself. It is rather irritating to be admitted as a surgeon with the grave warning (I quote exactly from a recent pediatric paper) that "It is impossible for the otologist to size up a whole clinical setting of which the otitis media may be a very minor part." Unfortunately this so-called minor role of the suppurating ear is frequently the stumbling block of the pediatrist and the problem of the otologist, whereas there should be the greatest cooperation based on a dove-tailing of experience. If the pediatrician has excluded all other causes for the toxemia, mild or severe, which is always part of the picture, we, the otologists, should be able to evaluate the role of the ear. And if we are not able to fit it to the whole clinical setting, then we have reduced our specialty to a cult, an osteopathy of the temporal bone.

Why should we ever minimize the danger of a diseased ear? Why should we have to wait for text-book signs when a patient is presenting untoward and unusual symptoms? Why repeat a myringotomy time after time? (I have known fifteen to be done by the pediatrician on one ear in the space of two weeks.) We should know that the abscess is no longer confined to the tympanic cavity and that repeated incisions are only an insult and a handicap to the inflamed tissue. Why disregard chilliness with well defined elevations in temperature or ascribe it to pus cells in the urine, and suddenly awaken to the fact that we are dealing with a thrombosis of the lateral sinus with a blood stream full of bacteria? Why fail to consider the importance of the second requirement of the Gra-

denigo syndrome, namely, severe, spasmodic and intermittent pain along the distribution of the trigeminal branch of the fifth nerve, and later have to face the tragedy of a fatal meningitis? Why overlook profound deafness, with vertigo and perhaps slight nystagmus, when we know how well a patient with an uncomplicated double otitis media may hear, to struggle through the hopelessness of a meningeal involvement or later find our patient totally or partially deaf as a result of cochlea degeneration brought about by prolonged congestion of the labyrinthine capsule?

I have done all these things (except repeated incision of the drumhead, from which sin my soul is free) in the effort to save my patient from a mastoidectomy. They are errors of conservatism often neither logical nor justifiable, even if we had nothing to depend upon except our clinical observations. With laboratory methods at our command to supplement our experience, why should we sometimes fail to follow the dictates of our convictions?

It is not the object of this paper to enter into the bacteriology, the blood picture, or the value of the roentgenograms. They are supplementary aids of the greatest value, but far more variable than the clinical manifestations which must always be given precedence. In this connection I particularly call your attention to the work of Hadjopoulos on the bacteriology of mastoiditis (*Annals of Otology, Rhinology and Laryngology,* 1930), and Judd's work on "The Role of the Eosinophil in Otological Conditions" (*Laryngoscope,* March, 1930), which he is still carrying out at the Baltimore Eye, Ear and Throat Hospital, and which seems to offer more diagnostic aid than we have heretofore received from the blood count. The review of acute and purulent otitis media by Kopetzky (October, 1931, *Archives of Otolaryngology*) is also a most comprehensive and important piece of work.

In conclusion, I summarize my observations as follows:

(1) Mastoiditis is not difficult to visualize and diagnose if one is familiar with the anatomy of the temporal bone, the histoanatomy of its cell structure and the pathological changes brought about by pyogenic infection.

(2) In most cases the pathological changes are comparatively slow, giving us sufficient time to study carefully the symptoms of each case and to anticipate and usually avoid certain dangerous complications.

(3) If a patient presents no general contraindications, surgical intervention is far safer in a borderline or doubtful case than anxious waiting which may give cause for deep regret.

Discussion follows paper of Dr. Mahoney, page 874.

THE TREATMENT OF ACUTE MASTOIDITIS*

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Acute mastoiditis is such a potentially serious condition that I feel a consideration of its treatment is justified. Its causes are so varied, the possible complications are so many and so different, and it is associated so frequently with some general condition that its treatment cannot be reduced to a routine practice. Time will not permit a detailed discussion of this subject, but I shall try to present a few procedures that have been found useful in determining the severity of the infection and the complications, a few general conditions that influence the prognosis, and a technic of operation that gives a better cosmetic result and a more rapid convalescence.

An acute otitis media may be considered as a preoperative stage of acute mastoiditis. All investigators are agreed that if the drum membrane is permitted to rupture spontaneously an otitis is more likely to be complicated by an infection in the mastoid. For this reason, whenever the clinical symptoms and findings indicate that a middle ear infection is present, a myringotomy should be performed with aseptic technic.

Of the many remote conditions that may influence infections in the middle ear and mastoids, I shall speak of only two: nasal sinus infection and those associated with hyperglycemia. When an otitis or a mastoiditis is present the nasal sinuses may also be infected. The ear infection may not respond unless that in the sinuses is also treated. It is not at all unusual for a persistent aural discharge to subside after drainage of an empyema of a maxillary antrum or after vigorous treatment directed to the sinuses in general.

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It is well known that diabetes is often complicated by cutaneous and other acute infections. However, the infections that occur in the ear and mastoid with diabetes have been treated without discovering or treating the disease. The history of past illnesses will often disclose the fact that the patient has been or is under observation for diabetes mellitus. If an otitic infection persists or if the wound after mastoidectomy fails to heal, the urine and blood should be examined for their sugar content. An increase in the amount of sugar in the blood may be present when none is found in the urine. I am certain that proper treatment has favorably influenced the course of ear infections for me in a number of patients and in several instances has prevented the development of a mastoiditis requiring operative treatment.

Blood culture before a simple mastoidectomy is often a valuable procedure. Eggston[1] considers it one of the most important laboratory tests in complicated mastoiditis. It is of particular importance in those infections characterized by a rapid onset, a septic temperature, and great prostration. If the blood culture be positive, the lateral sinus should be carefully inspected at the time of operation. If diseased, it should be obliterated, thus preventing a possible second operation. In the presence of marked symptoms, even with a negative blood culture, the vein should be examined. If the vein is not diseased, the patient should be examined for some other condition causing the symptoms.

Eggston[1] emphasizes the importance of spinal fluid examination in the postoperative period when there are obscure symptoms or signs of meningeal irritation. I feel that the same importance should be attached to spinal fluid examination in the preoperative period when meningeal symptoms are present. Some time ago I was called to see a baby suffering from an acute bilateral otitis media of several days' duration with symptoms of acute mastoiditis and meningeal irritation. Spinal fluid examination showed that a meningitis was present. Because of this finding, the patient was not operated upon. At autopsy, the mastoid processes were free of signs of infection.

Very often patients are seen late in an attack of acute otitis media and mastoiditis with a greatly reduced number of red cells and percentage of hemoglobin. When the disease has a sudden onset and rapid course, these same blood findings are occasionally seen earlier. Should these findings be present, a transfusion before operation will increase the resistance of the patient, lessen the danger of complications, make for a better prognosis, and shorten the period of convalescence.

On the basis of clinical and pathological findings, acute mastoiditis may be divided into a number of types. Kopetsky[2] recognizes two main types, namely, the acute coalescent and the acute hemorrhagic. He emphasizes the distinction between them. Joseph Beck[3] describes the latter as thrombotic mastoiditis.

Acute coalescent mastoiditis is the type generally encountered. It occurs most frequently as a complication of upper respiratory tract infections. Any of the pyogenic organisms may be the exciting cause. It is characterized by a breaking down of the intercellular walls, a coalescence of the cells, and the formation of pus and granulations. The destruction may involve but a few cells; it may be seen in the form of a tip abscess, with or without breaking through into the soft parts of the neck. It may be centrally located or destruction may have taken place to the extent that all of the cells have coalesced. In some instances pus breaks through the cortex to form a subperiosteal abscess. Frequently a low grade destructive process may remain localized for a long period of time in the region of the antrum. This condition is most frequently seen in small processes having small cells and thick septa. Infection of neighboring parts occurs by direct pressure necrosis.

The symptoms presented by the patient in acute coalescent mastoiditis are usually those of a mild infection to which are added those of suppuration in a confined space. The clinical symptoms may be misleading and may vary to a great extent. Extensive lesions may be found at operation preceded by only a few of the classical symptoms, or many of the classical symptoms may be exaggerated and at operation very little evidence of infection be found.

Pain, moderate elevation of temperature, aural discharge, increased leucocyte count and positive x-ray findings are not indications for operative procedures in the early stages of acute mastoiditis. Pain may be intense, but it is not the rule when a profuse purulent discharge is present. Pain and discharge are not sufficient to justify an operation. Since acute otitis media and mastoiditis are complications of other infections, a continuance of the primary infection may be responsible for some of the symptoms.

In spite of treatment, should a moderate to a profuse purulent or mucoid aural discharge con-

tinue, accompanied by an afternoon elevation of temperature, pain on pressure over the mastoid process, increased leucocyte count, very gradual reduction in the number of red cells and percentage of hemoglobin, a shifting to the left of the Schilling white cell count, increased toxic appearance of the patient, and positive x-ray findings, operative treatment is indicated. Most often the acute coalescent type of mastoiditis is encountered. While many of the symptoms of acute mastoiditis may become exaggerated early and necessitate operation, it is more often the rule that these patients may be observed and treated for four to six weeks without danger of complications or impaired hearing. With those patients that do not show marked tenderness, septic temperature, severe prostration, and a daily decrease in the number of red cells and percentage of hemoglobin, watchful waiting will often be rewarded. Early mastoidectomy may excite nothing unusual, but it may release septic thrombi capable of producing fatal complications.

Roentgenograms are an invaluable aid in the diagnosis of mastoiditis. However, they should not be depended on to the exclusion of all clinical and other laboratory findings. In an infection, as soon as the cells of the mastoid are filled with an exudate, roentgenograms will indicate that an infection is present. This does not mean that an operation should be performed at once, for many simple exudative processes in the mastoid cells will subside without operative treatment. If the condition progresses to the extent that the roentgenograms show bone destruction and coalescence of cells, then operation should not be delayed further.

The hemorrhagic type of acute mastoiditis is encountered less frequently. It is characterized by numerous thrombi in the minute venules of the lining of the mastoid cells. There is never a coalescence of the cells in this type with the formation of pus. Bacterial examinations show hemolytic streptococci present in this kind of trouble. Spread of the infection occurs through metastases and may reach distant parts of the body.

Pain, septic temperature, severe prostration from the onset, and scant aural discharge are the symptoms most often encountered. Roentgenograms show a cloudiness of the mastoid process from the exudate within the cells, but no actual destruction of the cellular structures.

Should a patient have an acute otitis media with a septic temperature and severe prostration from the onset with a daily reduction in the number of red cells and percentage of hemoglobin, an acute hemorrhagic mastoiditis probably is present. When this picture is presented, mastoidectomy should be performed immediately. Complications and a long convalescence are more often seen in cases in which operation has been delayed.

My method of operating for the past four or five years, while not original, has many advantages over older procedures. When gas anesthesia is used, it is not begun until the patient has been placed upon the table and properly draped. The primary incision may be made in a few seconds. The usual curved posterior auricular incision is made, but instead of following close to the auricle it is located three-fourths of an inch behind the auricle and made through the skin only. The skin is elevated and an incision made through the periosteum about one-fourth of an inch posterior to the mastoauricular junction.

The mastoid process may be opened by any method. After the cells have been completely removed, a careful examination of the structures around the process should be made for evidences of extension of the infection. In acute coalescent mastoiditis, complications most frequently arise by pressure necrosis and direct extension. Necrosis may be found in the region of the tegmen antra with exposure of the dura, or necrosis may be through the sinus plate into the labyrinth, in Trautman's triangle, or in the inner table of the suprasinal cells. A phlebitis of the lateral sinus is unlikely even with sinus plate necrosis unless there are granulations and exudate on the sinus wall. I do not think that periphlebitis, even if extensive, is sufficient to warrant an obliteration of the sinus in the absence of symptoms of systemic infection. Those patients with a periphlebitis without systemic signs of thrombosis of the sinus that I have treated have recovered without obliteration of the sinus. If one does not find necrosis in the locations given, the patients usually rapidly recover.

Contrasted with the acute coalescent mastoiditis, the hemorrhagic type does not present findings at operation that are of prognostic importance. Since extension of the infection occurs through metastases, the patient should be carefully observed for complications during the postoperative period.

After completing the operation the wound is painted with a tincture of iodine solution and closed with a subcutaneous suture down to the lower angle of the wound. Through this angle is inserted a small rubber tissue drain. In pa-

tients presenting posterior auricular infiltration and edema, the wound is allowed to remain open until all of the acute symptoms have subsided, and then it is closed in the above manner with local or gas anesthesia. Before the head dress is applied, a piece of gauze containing an oval opening is placed over the auricle to prevent it from coming in contact with the wound. This method of incision and closure eliminates the unsightly depressed scar seen frequently following operation by older methods. Dressings are almost painless, the uncomfortable head dress is soon dispensed with, and the convalescence is shortened a number of days.

To shorten the period of hospitalization and convalescence and to detect symptoms of ensuing complications, the postoperative period requires careful observation and treatment.

The external auditory canal should be kept as free of secretions as possible. This will facilitate better drainage and prevent painful skin irritations. Frequent examinations of the nose and throat should be made and treatment given when indicated. The intake of fluids and free elimination are necessary. In children the aid of a pediatrician is helpful in outlining the diet and general care. In older patients, the aid of an internist is of especial assistance. In patients in whom pain and fever persist without known cause we should suspect a complication. Here the use of the laboratory may be of great assistance. The blood should be examined daily to determine the number of red cells, the percentage of hemoglobin, and changes in the Schilling white cell count. Kopetsky emphasizes the importance of a persistent unilateral headache with a septic temperature, decrease in the number of red cells and decrease in the percentage of hemoglobin. It should lead one to inspect the lateral sinus for the presence of a thrombus. I feel that it is better to risk doing an unnecessary operation than to wait for the appearance of a positive blood culture.

A blood transfusion may be given in any of the three periods of treatment, the preoperative, operative, or postoperative, but it is in the postoperative period that one is most often given. From a study of a small group of cases which were treated with blood transfusions combined with a germicidal dye, Lillie[4] states that the patients receiving only blood transfusions seemed to get along as well as the patients that received combined treatment. He says that surgical treatment is not supplanted by either of these methods, but feels that they have their place in the management of sepsis of otitic origin. The role that blood transfusions play when the offending focus has been removed cannot be overestimated. Dyes may be of value as germicidal agents. Personally, I have not had enough experience with germicidal dyes to form an opinion as to their value.

In reporting a case history, Mackenzie[5] refers to anemia, scanty secretion, and lifelessness of the wound as being quite characteristic of diabetes. He states that in any patient in whom there is a lack of red granulations after ten to fourteen days following operation upon the mastoid and in which there are signs of a destructive process extending beyond the original limits of involvement, one is justified in thinking of diabetes. I can recall instances in which the blood sugar was slightly elevated and in which I felt that convalescence was shortened and complications probably avoided by the administration of insulin and regulation of the diet.

As previously stated, spinal fluid examinations should be resorted to in all patients that manifest any symptoms of meningeal irritation.

I recently had a patient who gave the history of having developed a cold in his head about three weeks previous to his coming to my office. He said that several days after the onset he noticed a loss of hearing in the right ear with a dull pain in the right temporal region. This pain was fairly constant but was relieved by aspirin. Other than this, he said that his health had been good. His temperature was 99°, pulse 80, and respirations were 20. The right external auditory canal was sagging to the extent that the canal lumen was greatly diminished. The drum was intact, dull red in appearance, not bulging, and hard to differentiate from the canal. All of the landmarks were obliterated. Hearing was badly impaired. While the left ear was normal in appearance, hearing had been diminished for a number of years. The remainder of the examination, including examination of the eyes, was negative. Myringotomy was performed without the escape of secretions and a culture was taken for examination. An x-ray of the mastoids was taken and the patient sent home.

The next day, there was a partial facial paralysis on the right side. There was no drainage from the ear and the culture revealed no growth. The leucocyte count was 13,000; the number of red cells and the percentage of hemoglobin were normal. The x-ray findings were those of an acute mastoiditis with evident cell destruction in the region of the tip. The mastoid process was opened and a large abscess was found in this region. The intact cells were very small and extended into the zygomatic area. They were filled with an exudate. A culture was taken for examination.

The second day there developed a septic temperature with corresponding elevation of pulse and respiration. Pain, dull in character and fairly constant, continued in the right temporal region. Blood was taken for culture. There was no growth obtained from the culture of the wound, and the blood culture was negative. The temperature continued septic, with rigors and sweats, the white cell count rising, and the number of red cells and

percentage of hemoglobin remained normal. Blood for culture was taken daily but no bacteria were found. Pain in the temporal region remained unchanged while the paralysis improved. He began to have periods of restlessness with periods of drowsiness. Chills and sweats were numerous. There were no other positive findings.

The first spinal fluid examination was negative. The second revealed a slight increase in pressure with a cell count of 15 lymphocytes, but was otherwise negative. The third examination showed 34 cells with only a slight increase in pressure. There was very little change in the condition of the patient. At this time, the sixth day following the operation, the paralysis was hardly noticeab'e, the appearance of the ear canal and drum membrane was apparently normal, and the hearing remained unchanged. A tentative diagnosis of brain abscess was made. The wound was reopened and the lateral sinus exposed. The vein appeared normal. The dura in the region of the tegmen antra was exposed and appeared thickened and hyperemic. A crucial incision was made and a small cavitation in the temporal lobe was found. There was no pus present, but a culture was positive for the pneumococcus. The patient died from meningitis several days later.

At autopsy a small brain abscess was found in the right temporal lobe, which was 3 cm. in diameter and contained a grayish exudate. Sections showed very little proliferation of fibrous tissue with little evident effort toward the walling off of the abscess. Smears from the exudate showed the presence of the pneumococcus. I feel that the spinal fluid findings indicated to us the probability of a brain abscess, and, associated with the clinical findings, assisted in making the diagnosis.

CONCLUSIONS

(1) Early aseptic myringotomy in otitis media will prevent many infective mastoids.

(2) Infection in the paranasal sinuses and diabetes occasionally complicate mastoiditis and delay recovery.

(3) Blood culture, spinal fluid examinations and examination of the blood, including red, white, hemoglobin and differential determinations are essential laboratory procedures in treating acute mastoiditis.

(4) An exudative mastoid infection may subside without operation.

(5) Early operation is indicated in coalescent and in hemorrhagic mastoiditis.

(6) Operative technic and postoperative care are described.

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DISCUSSION (*Abstract*)

Papers of Dr. Downey and Dr. Mahoney

Dr. M. M. Cullom, Nashville, Tenn.—I was interested in the Doctor's observation that the relative absorptive power of the antrum of an infant is fifteen or twenty times that of an adult. I knew, of course, that because the petro-squamosal suture is not closed before two years of age, the danger of intracranial involvement is much greater in the infant than in the adult.

My opinion is that mastoiditis is always a secondary infection and the method of dealing with the case will be governed by the primary cause of the infection. The method of dealing with the case will also be largely influenced by whether we have seen the case from the beginning or whether we are brought into it late. I see comparatively few cases of mastoiditis that go on to operation where I have had an opportunity to incise the drum early and take care of the case afterwards. Most of the cases of mastoiditis that I operate upon are ones that are brought to me after the third week when there is tenderness and edema over the mastoid and the cells are broken down and filled with pus and granulations. In these cases there is only one decision to be made, and that is to open the mastoid and drain as soon as possible.

Since I have been studying the question of the connection between purulent infection in the nasal sinuses and mastoiditis, a light has gradually dawned on me that has profoundly affected my attitude toward the surgical drainage of the mastoid. In every case that has come to me with mastoid symptoms for the last eleven years, I have examined the sinuses, and for the last eight years I have x-rayed the sinuses of every case where possible. I was astonished to find with what regularity transillumination and the x-ray disclosed an infected antrum on the same side as the mastoid. I had a number of cases that were slow to heal until the infected antrum was drained, and then healing was immediate and rapid. Any infection that is secondary to a primary focus should heal quickly after the primary focus is eradicated. The prognosis of the mastoiditis is bound up with the prognosis of the infected sinus. If the infected sinus clears up, the mastoiditis should clear up also. If the infected sinus is left alone and does not clear up, the chances are that the mastoid cells will go on to destruction and require surgical drainage. I believe, though I have had no opportunity to put it to a practical test, that if we drain the infected antrum before the mastoid cells are broken down, the mastoid cells should clear up.

I was delighted to hear Dr. Downey speak as he did about multiple incision of the drum. I have been amazed to hear of a dozen incisions of the same drum. My experience has been that the pressure of the pus behind will keep an adequate incision of the drum open as long as there is any pus in the middle ear to come out. If the symptoms persist after an adequate incision of the drum, and there is no drainage, the chances are that the trouble is in the mastoid itself.

Bloodstream infection is a rare complication of mastoiditis in Nashville. I have had only 3 cases in my practice. I operated upon two; the other declined operation. Mortality in all three cases was 100 per

cent. All were neglected cases and were seen in the late stages.

Dr. George B. Collier, New Orleans, La.—Everyone should realize the relative size of the mastoid in proportion to the body weight of the child compared to the adult; also that it is very much easier for an infection to get into the Eustachian tubes of an infant and child than of an adult. Bearing these facts in mind, one should always be on the alert for an otitis media, and when it is found do an early and complete tympanotomy without delay. But I believe that the Doctor is unduly alarmed about the proportion of mastoids which are neglected. And I disagree about the saying that an ear with profuse discharge and slight temperature needs operation at the end of two weeks. I believe these cases even after a much longer time, if they are clinically in no danger and not suffering, should be given a chance to recover. Never use the time limit and the amount of discharge as an operative guide, but study the case from all angles, and if the general condition and the Schilling index is satisfactory, regardless of the x-ray and amount of discharge, treat the case, and in the meantime try to build up the resistance.

I have at times done repeated tympanotomies to save my patient a mastoidectomy, and I feel that I have saved quite a few.

Dr. Louis Daily, Houston, Tex.—If an early operation in acute mastoiditis will prevent complications such as sinus thrombosis, septicemia, brain abscess and meningitis, then one is justified in operating early before definite signs and symptoms have manifested themselves.

The signs and symptoms of mastoiditis vary so much in different individuals that it is difficult at times to make the differentiation between the coalescent and the hemorrhagic types before operation. I have seen cases with marked destruction of the bony cells, with little or no temperature, with very little pain, with no swelling, and no edema behind the ear. In these cases the outer plate of the skull was very hard and remained intact and the destruction took place at the inner plate. Then again some cases have had a profusely discharging ear for weeks, with tenderness over the mastoid, some edema, high septic temperature, marked headache, anemia, leucocytosis, cloudiness of the cells but no destruction as demonstrated by the x-ray, and have cleared up promptly after irrigation of an infected antrum on the same side, or after eight to twelve weeks of conservative treatment.

All of us agree that an operation is indicated in cases with a fistula in the outer cortex, subperiosteal abscess, marked destruction of bony cells as shown by the x-ray, severe pain, prostration, high temperature, leucocytosis and progressive anemia. In children, the antrum is large and the Eustachian tube is large and straight, providing good drainage for the mastoid cells. This explains why many cases of acute purulent otitis media will clear up after adenoidectomy promoting drainage along the Eustachian tube. In babies I remove the adenoid at the same time that I do the antrotomy.

The indications for operation may be misleading in acute mastoiditis due to *Streptococcus mucosus*. Here the secretion usually is scanty and serous in character. The organism has a predilection for bony destruction and the process may be slow. This may take place while the patient is recovering from his middle ear infection. Thus we may have at the same time a healed drum membrane and a marked destruction of bone in the mastoid. The destruction may be of the inner plate only. Sinus thrombosis, subdural abscess, temporal lobe abscess, are more common in this type of case.

It was Politzer who first called attention to the fact that in every case of acute middle ear infection the mucous membrane lining the mastoid cells is inflamed. The extension takes place by continuity along the mastoid antrum. Dr. Mahoney is right in his contention that an early myringotomy, providing free drainage, will in a great majority of cases prevent bone involvement.

Sinus thrombosis is the most common complication of acute mastoiditis. If a patient develops, following an operation, a high temperature with or without chills, we should suspect sinus thrombosis. In children we must think of glandular fever that will simulate sinus thrombosis.

If the thrombus fills the sinus, usually nothing short of removing the thrombus and jugular ligation will cure the case. But in parietal thrombi, where we have an osteophlebitis and sepsis, blood transfusion alone often will effect a cure.

Dr. L. Chester McHenry, Oklahoma City, Okla.—The incidence of surgical mastoiditis in cases of otitis media has seemed higher in the large Eastern clinics than we have found it to be in the Middle West. Many cases that would have been operated upon at once in hospitals in the East have gotten well without operation, with dry ears and intact drums, in our Middle Western practice. It would be very interesting to know whether this is due to climatic conditions, to more virulent infections, or to poorer general resistance of the patients. Also, it would be very interesting to know whether you in the South have had a similar experience.

In the prevention of mastoiditis requiring surgical interference, stress should be laid upon several points:

(1) Train the patient to avoid forcible blowing of the nose, especially in the presence of acute colds and when swimming.

(2) Early incision of bulging ear drums is advisable. It is much better to incise a case which might have subsided without rupture then to delay and increase the danger of mastoiditis.

(3) Vigorous treatment is necessary of the nasal, and especially the nasopharyngeal infection practically always present in cases of acute otitis media.

(4) We firmly believe that gentle daily suction by means of a Siegel otoscope is of great aid in preventing surgical mastoiditis.

The determination as to when a case with otitis media also has a surgical mastoid is at times very difficult indeed. In the coalescent type it is very doubtful whether the aural findings will ever indicate more pathologic change than is actually present. In hemorrhagic cases the change is usually more extensive than aural examination indicates.

Roentgenograms will show fluid in the mastoid cells early in practically all cases. When definite destruction of bony cell walls is demonstrable, and especially when serial films show progressive destruction, operation is certainly indicated. However, the x-rays will help positively only in the coalescent type of case. In the hemorrhagic cases they will show only fluid early or late, and operative indications cannot depend on x-ray findings.

In the coalescent cases, clinical findings will usually guide us safely to the operating room, or away from it. The x-ray, in showing increasing bone destruction, serves to keep us from temporizing too long. We must consider the individual case in the light of aural examination, bacteriologic findings, general systemic reaction, serial blood count, and x-ray pictures.

Early operation in coalescent mastoiditis, before bone destruction is evident, is unnecessary and often may be dangerous. In the hemorrhagic cases early operation may be necessary to prevent serious complications.

Dr. W. Likely Simpson, Memphis, Tenn.—I believe, like Dr. Cullom, that we have sinus disease in practically all of our middle ear infections, and I believe it is usually pansinusitis. The progress of the middle ear infection, however, depends somewhat on the sinus condition and the middle ear infection depends somewhat upon the anatomical condition, the resistance of the patient and the type of infection.

In treating middle ear disease and mastoid conditions we attempt three things: first, to save the life of the patient and prevent complications; second, to obtain normal hearing if possible; third, to obtain a dry, closed drum.

We should do a fairly early, and as H. Newman has suggested, a very complete mastoid operation.

Dr. Oscar Wilkinson, Washington, D. C.—The treatment of the nasopharyngeal space is frequently neglected in acute conditions. It is advantageous to clear it two or three times a day.

Dr. Simpson mentioned the importance of conservation of the hearing. A mastoid operation in those cases that run a slight temperature with profuse discharge for ten or fifteen days is indicated. If we permit the middle ear to suppurate excessively for a number of weeks, we never get a normal ear as far as hearing goes. Besides, we run the chance of very serious complications.

Dr. John R. Hume, New Orleans, La.—Early opening of the ear drum is sometimes necessary. However, it is my habit to put the patient to bed and give stoops to keep the Eustachian tube open for twenty-four hours. I think that will do more to clear up the condition than immediately to open the drum when there is slight redness.

The von Schilling test has been of special value in our hands. It gives as much information as to the condition of our patient as anything we have at our command. A constant increase of the new forms of the white cell, with low eosinophils and declining monocytes, is certainly evidence of trouble; and even if the patient does not appear to be doing well, an increase of monocytes, increase of eosinophils and the formation of immature cells is reasonable assurance that he is progressing nicely.

Dr. Downey (closing).—Dr. Cullom is undoubtedly right that involvement of the maxillary antrum influences co-existing ear infections.

I wish there had been time to show several lantern slides of the clinical course of acute hemorrhagic mastoiditis. In 2 of my patients the blood stream became involved within forty-eight hours. Certainly the pathology in these cases is not that of the classical thrombosis of the lateral sinus.

I am afraid Dr. Collier has rather misinterpreted my conclusions. I do not mean that every case that is not well within two weeks must be operated upon. Of course, most of these patients will recover; but after this length of time, a patient who still shows a profusely discharging ear with an elevation of temperature some time during the day is within the danger zone. Dr. Simpson and Dr. Wilkinson have rightly emphasized the importance of the preservation of hearing in these patients. Why should we let them drag on when the complications which may arise are much more serious than the disease itself or the operation to cure it?

I cannot agree that repeated incisions of the drumhead are ever justifiable. After a certain length of time the mucous membrane of the tympanic cavity becomes swollen and edematous and we are simply cutting into thickened tissue, promoting scars and adhesions and not establishing better drainage.

Finally, I believe that climatic conditions often influence the severity of these infections. Certainly in Baltimore we do not see the number of virulent cases of mastoiditis encountered by the otologist in New York or Boston, for example. It is very probable, therefore, that we just below the Mason-Dixon line see graver and more rapid infections than you men in the milder climate of the deep South.

Dr. Mahoney (closing).—I do not think that a running ear, without other symptoms, of two or three weeks' duration is an indication for mastoidectomy.

Ruttin has said that meningitis of otitic origin is the saddest chapter in otology. The discussion has brought out the fact that the final chapter has not been written on this subject.

EXPERIENCE WITH RABIES AND ITS PREVENTIVE TREATMENT IN SOUTH CAROLINA*

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The Hygienic Laboratory of the South Carolina State Board of Health was established July 1, 1909. Preparation of antirabic vaccine was begun at once and patients soon began to arrive from various sections of the State for treatment which was administered for about one year at the Laboratory only, after which time the vaccine was mailed out for administration by the patient's physician.

The number of patients needing antirabic treatment increased from 114 in 1909 to 1,083 in 1929 and to 1,235 during the last twelve months, more than a tenfold increase. Each year for the past 15 years there have been patients from practically every county in the

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State, the largest number occurring generally in April, May, and June, and the smallest in November, December, and January. Every three or four years there has been a temporary decrease in the number of patients from the previous year, but the general trend for the last 21 years has been a rapid, progressive increase.

Apparently there is as yet no race suicide in South Carolina, judging from the numerous patients, in not a few instances from the same household, bitten by the family pet dog, anywhere from 5 or 10 up to 26 being bitten by the same dog, the number dependent upon the fertility of the family and the sociability of the neighbors. From July, 1909, to October, 1931, we have treated 13,849 patients with 27 deaths. In addition, 11 infected patients died without antirabic treatment. Four hundred and seventy-two of the total number of patients discontinued treatment after finding it unnecessary from laboratory diagnosis or from clinical history of the animals under observation, these being deducted in computing percentage figures.

There are no indications that human beings possess any natural immunity to rabies. However, only about 15 to 20 per cent of untreated persons bitten by rabid animals or otherwise exposed to rabies contract the disease. In the 80 to 85 per cent that escape infection the wound may be too slight to permit entrance of the virus; some mechanical removal of the virus by clothing or otherwise may have occurred; or cauterization of the wound may have possibly destroyed the virus completely. The most dangerous wounds are those of the face, head, and finger tips. Strong nitric acid, applied as soon as possible, at least within 48 hours, is the best cauterizing agent for all wounds made by rabid animals, phenol, tincture of iodine, mercurochrome, and other such antiseptics being unsatisfactory.

By bulletins, lectures, letters, newspaper articles, and other means we try to impress upon both physicians and laity the importance of not killing a suspected animal at once, but of keeping it under observation for ten days, advising those bitten by the animal to start the treatment and discontinue it later if it is found to be unnecessary. They are gradually learning not to kill the animal as soon as they are bitten, since it is not infrequently difficult or impossible to find the Negri bodies in the brain in the early stages of the disease. In the hog we very seldom find the Negri bodies, even though the clinical history of rabies is typical. Treatment in such a case, as well as in the case of animals killed too soon and giving negative laboratory findings, is or is not advised, dependent upon the clinical evidence only. The heads of practically all kinds of warm-blooded animals are sent in to us for examination, from chickens, hawks, rats, squirrels, rabbits, and cats on up to dogs, hogs, billy-goats, sheep, cows, mules, horses, and human brains. We receive from 400 to 500 heads a year, an average of only 50 per cent being found positive for rabies, despite the usual rumor among physicians and others that no head is ever found negative at the Laboratory. History cards are sent to physicians to be filled in for each patient, showing among other data, date, number, location, and degree of wounds, method of cauterization, and symptoms of animal with its method of death, to aid us in advising as to the need for treatment and in determining whether the regular or the large size dose should be sent.

From July, 1909, to January, 1917, Pasteur's dried cord method was used, this complete treatment of 21 doses being administered to 1,651 patients with 11 deaths, a mortality rate of 0.66 per cent.

In January, 1917, the late Dr. F. A. Coward, Director of the Laboratory until 1922, discarded the dried cord method in the interest of economy and expected improvement in the mortality rate, and introduced a modification of the Hoegyes dilution method, using a 1:1000 suspension of the fresh, living fixed virus in 0.5 per cent phenolized physiologic salt solution with 21 doses of 2.5 c. c. each, all doses being of the same strength and volume. From January, 1917, to January, 1927, 6,988 patients received the complete treatment by this method with 15 deaths, a mortality rate of 0.21 per cent, as compared with the mortality rate of 0.66 per cent with the dried cord method.

Encouraged by this marked improvement in results, we modified the Hoegyes dilution method still further in 1927, increasing the strength of the fresh, living fixed virus suspension from 1:1000 to 1:500 and using 21 doses of 2.5 c. c. each in 0.3 per cent phenolized physiologic salt solution, with doses increased to 4 c. c. for adults bitten on the face or head or severely elsewhere. From January, 1927, to October, 1931, 4,738 patients were given the complete treatment by this latter method with only 1 death, a mortality rate of only 0.021

per cent. This death occurred two years ago in the case of a three-year-old child who was bitten severely on the face and head by a rabid bulldog and who died before treatment could be finished.

The reduction in our mortality rate from 0.66 per cent with the dried cord method to 0.21 per cent with the 1:1000 fresh virus suspension in 0.5 per cent phenolized salt solution, a threefold improvement, and to 0.021 per cent with the 1:500 fresh virus suspension in 0.3 per cent phenolized salt solution, a tenfold further improvement, is sufficiently impressive. The results with our fresh, living virus suspension method are superior to any other published results or claims, as far as is known, irrespective of method. Furthermore, out of our total number of 13,849 patients treated from July, 1909, to October, 1931, not a single case of antirabic vaccine or treatment paralysis has occurred.

In making our stock suspension of living fixed virus the brain of a rabbit completely paralyzed with rabies is aseptically removed and ground up in four parts of pure, sterile glycerin without phenol, the desired dilution being made as needed with sterile phenolized physiologic salt solution. The so-called minimum lethal dose of fixed virus for the rabbit is the amount for intracerebral inoculation required to paralyze the rabbit completely in seven or eight days. This amount has been found to be about 0.015 mg. of a good virus and may be designated as the unit. Each regular 2.5 c. c. dose of our present treatment contains 5 mg. of the living fixed virus, or 317 units, each large 4 c. c. dose containing 7.5 mg., or 500 units. Each patient with the twenty-one 2.5 c. c. doses receives 0.1 gm. of living fixed virus, or 6,666 units, while patients with the 4 c. c. doses receive 0.16 gm., or 10,665 units. One rabbit will furnish virus sufficient for the complete treatment of about 90 patients. All doses are made up fresh daily in sealed glass ampoules and mailed out fresh daily for each patient, the fresher the dilution the more active the virus. The average cost of all materials and supplies used in the preparation and distribution of the treatment, but not including its proportion of overhead cost in salaries and rent, is 84 cents for each series of 21 doses. For a little greater economy and convenience we shall hereafter prepare a 1-4 stock suspension of fixed virus in glycerin and make a dilution of 1-400 with salt solution, using 2 c. c. and 3 c. c. doses of this dilution for the regular and large doses, respectively. This will be a reduction in the volume, but not in the strength or efficacy of our present dosage.

The preventive inoculation of unbitten dogs with a 5 c. c. dose of 20 per cent killed antirabic vaccine has been used to a considerable extent in South Carolina, but no available records have been kept by State, cities, communities, or individuals upon which to formulate any accurate judgment as to its efficacy. Judging from the continued yearly increase in the number of patients taking antirabic treatment in South Carolina, it seems to have had no effect whatever. It must be admitted, however, that out of the several hundred thousand dogs in the State probably only a negligible number as a whole have been inoculated. On the other hand, it does appear that, when all dogs in certain given localities are inoculated, it is of considerable value in reducing the number of rabid animals in those particular sections. For the most part this is rather an impression only, without actual figures upon which to base a definite conclusion. There is no doubt, however, that this preventive inoculation of unbitten dogs fails to protect many of them against later exposure, for it is not at all unusual for us to find the Negri bodies in dogs that have been so inoculated from four to twelve months previously, the clinical histories also being typical of rabies. This is not necessarily an argument against inoculation, for there are failures recorded against inoculations of scientifically proved value. Under the present status of the present mode of the preventive inoculation of unbitten dogs its actual value appears to be a matter of conjecture, and an attempt to make it compulsory would seem to be a little premature. A great many more voluntary inoculations under competent control and with accurate and complete records are necessary for the formulation of any definite and accurate conclusions as to its real efficacy.

On account of our particularly favorable results with the antirabic treatment of human beings with fresh, living vaccine, compared with the results claimed for the use of killed vaccine, we believe that antirabic treatment of bitten animals with fresh, living vaccine is more effective than with the killed vaccine. In South

Carolina we advise in the case of bitten animals the use of at least six doses, preferably more, of fresh, living vaccine of proper strength and volume for the size of the animal.

By an act of the General Assembly in 1908, South Carolina empowers the State Health Officer and makes it his duty to declare animals with rabies to be quarantined and requires all county sheriffs and constables and all city police and health officers to enforce and carry out the quarantine regulations prescribed by the State Health Officer to prevent the spread of rabies from the infested locality. If the State Health Officer were or could be informed of the presence and location of such animals and if the enforcing officers would or could carry out the quarantine, this would be at least a start in the right direction, but in actual practice this law fails to function and would not cover the ground if it did function.

Some practicable combination of destruction or quarantine for a sufficient time of animals with suspected rabies; destruction, or proper antirabic vaccine treatment of bitten animals with the additional quarantine period needed; sufficient quarantine of imported dogs; licensing of all dogs; making animal owners legally liable for damages done; destruction of all worthless and stray dogs and cats with impounding of valuable strays; humane muzzling, if feasible; and voluntary inoculation, for what it is worth, of as many dogs, the chief carriers of the disease, as possible, would eradicate rabies from this country within a few years, if these rules were adopted and enforced by all the states. This is a difficult and serious problem, requiring the cooperation of the general public, and it is beyond the scope of this paper to attempt to offer any solution in detail.

DISCUSSION (*Abstract*)

Ross L. Laybourn, M.S., Jefferson City, Mo.—Dr. Smith's experience with different modifications of attenuated antirabic virus emphasizes the fact that the quantity of antigenic material administered is of the utmost importance in the effective prevention of rabies and those concerned with the administration of antirabic treatment can well afford to keep this fact in mind at all times. For the past ten years, my personal experience has been limited to material prepared by the Semple method. In exposures in which the wound was on the face or neck, as well as in those wounds of the trunk and extremities in which treatment had been delayed beyond the ordinary limits of safety, it has been the practice to recommend the administration of a standard Semple dose twice a day for seven days to be followed by one dose a day for seven days. The results obtained with this practice have been most gratifying.

Information on differences in efficiency, safety and absence of sequelae in the various types of preparations have not been sufficiently striking to warrant the National Institute of Health in restricting or condemning any particular type of treatment either by attenuated living or killed virus. Certain disturbances of the central nervous system which occurred so long after the administration of treatment as to make it impossible definitely to ascribe them to the treatment, however, were responsible for my decision to discontinue the use of attenuated virus in favor of the killed preparation.

Dr. Smith's mention of that universal and perennial libel on the laboratory, that is, that all heads are reported positive, will be appreciated by every laboratory director. This very general accusation probably arises from the wide variation of the clinical symptoms displayed by rabid animals, coupled with certain superstitions prevalent among the laity, and sometimes encountered in the medical profession, as to the appearance and actions of a rabid dog.

I regret that it has been impossible, within the time available, to obtain figures on the results of the immunization of dogs in Kansas City, Missouri, but by vigorous and well-nigh universal immunization of dogs in the City, a very satisfactory reduction in the incidence of canine rabies was secured. Experience in Detroit a few years ago showed that the incidence of rabies in immunized dogs was 0.36 per hundred, while the rate in unimmunized dogs was 4.49 per hundred. Cases in which a rabid dog has traveled across two good-sized counties have been encountered, and with such a wide potential distribution of the disease, almost universal immunization must be practised in order to effect an appreciable reduction of canine rabies in a state.

The problem of the treatment of an exposed dog is frequently encountered. The administration of the usual one injection treatment of killed virus in such cases will fail to protect a considerable proportion of exposed animals. The practice of giving one of these treatments every day for four or five successive days has been found quite effective.

Dr. Henry Hanson, Jacksonville, Fla.—I have just had the unpleasant experience of having two deaths from rabies in my State.

Vaccination of pets should include cats as well as dogs. Both the deaths to which I refer were due to bites of cats, one on the hand and the other on the arm.

I should like to ask Dr. Smith what he regards as the necessary interval for the establishment of immunity after the completion of treatment.

Dr. L. C. Havens, Montgomery, Ala.—I want to say a word about the vaccination of dogs and other animals for the prevention of rabies. It has been shown in the investigations of the Bureau of Animal Industry that more than one antigenic strain of virus exists: vaccines made from the strain in common use will protect against the strains which have similar antigenic composition, but will not protect against other strains. There are, in different localities, more than one strain.

Therefore, we cannot expect complete protection in all cases with the vaccines in use.

Dr. Jos. W. Mountin, Washington, D. C.—Most attempts to control rabies are designed to reduce the number of dogs and to circumscribe their movements. The difficulties encountered in attempting to enforce such laws are well known to health officers. Recently I have been told of a plan being inaugurated on the West Coast which is based on the principle of increasing the responsibility of the owner for the acts of the dog. The plan simplifies the method of collecting damages, including the cost of antirabic treatment. Laws embodying this principle should accomplish the purpose desired and be more susceptible to enforcement since punishment is not inflicted on the animal.

Dr. Francisco de P. Miranda, Mexico City, Mexico.—I wish to say a word about rabies in Mexico. Our Department of Health has required vaccination of dogs for a long time and we have had no trouble at all in Mexico in enforcing vaccination of all dogs in the Federal District. Persons wanting to have a dog in the house are required to send the dog every year to the laboratory to be vaccinated and pay what amounts to one peso, less than 50 cents, for the privilege of having a pet dog in the house. All dogs have to be vaccinated and wear collars and if they are found in the streets without collars they are sacrificed. In this way we have been able to reduce the mortality of rabies. The only cases lately in Mexico City have been persons from far districts brought into Mexico City in the hope of saving their lives. No cases have originated in the Federal District at all.

I think the departments of health ought to impress on the public that having a dog in the house is not a necessity and if they want the privilege they ought to pay for it.

Dr. William Litterer, Nashville, Tenn.—I wish to agree with Dr. Havens concerning the different strains of rabies shown by the Bureau of Animal Industry of Washington. We have at least three strains in Tennessee. However, the predominating strain is fortunately the Pasteur strain against which the virus in the Pasteur treatment confers an immunity. But against the occasional so-called wild strains the Pasteur virus does not confer an immunity. Hence you cannot expect protection in every case. To eliminate rabies it is necessary to have a dog law properly enforced. It is very difficult to pass such a law. We had such a law in Tennessee about 14 years ago due to the fact that two of the members of the Legislature were previously bitten by rabid dogs. In two years rabies was reduced to the minimum. At the next Legislature the law was repealed and two years later rabies was as prevalent as ever.

Dr. Smith (closing).—I think that since the dog is the chief carrier of rabies, prophylactic inoculations may be limited to the dog. I do not believe the people will ever be willing to go to the expense and trouble of inoculating their hundreds of thousands of cats.

The time for development of maximum immunity is regarded as fourteen days after completion of the twenty-one doses. All cases of treated patients dying of rabies at any time either during or after treatment are classed by us as failures of the treatment.

RETICULOCYTES IN PNEUMONIA*

A TEST OF A NEW THEORETICAL EXPLANATION OF THE CRISIS.

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and
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The explanation of the crisis in pneumonia is still obscure. There is no definite change in the pathological findings of this period; no increase in immune bodies has been demonstrated; and the separation of the symptoms due to anoxemia from those due to toxemia is difficult (Osler and McCrae, 1930). Various therapeutic measures have been developed on the basis of the physiology involved, although no system of treatment has met with universal success.

Anoxemia is one of the cardinal signs in pneumonia. Henderson, Haggard, Coryllos and Birnbaum (1929) consider it to be due to a "physiological" atelectasis, and on the basis of their investigations into the relief of this condition in the new-born, in asphyxia and in postoperative collapse they have developed a technic of carbon dioxide administration. Stadie (1921) considers the factors of bronchus plugging and coating of the alveoli with exudate as secondary and follows the explanation of Meakin (1921), who produced anoxemia by rapid shallow breathing, leading to insufficient aeration. He proposed to relieve the condition by increasing the oxygen tension, although his conclusions are that it is difficult to determine the effect of oxygen administration on the course of the disease.

A marked hemolytic anemia is a second accompaniment of pneumonia. Erythrocyte counts of two million are not at all uncommon and a positive icterus index has been demonstrated as practically universal (Elton, 1931).

In the presence of both an anemia and an anoxemia a reticulocytosis should follow. Since the crisis generally occurs at an interval of from five to seven days after the initiation of the disease, and relief from respiratory distress is one of the primary features, we have developed a tentative hypothesis that the reticulocytosis was the causal factor in the crisis. Reticulocytosis has been demonstrated as occurring three to four days after hemolysis by phenylhydrazine

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*From the University of Georgia Medical School.

hydrochloride in the dog (Krafka, 1930). Hence we may postulate a correlation in the time interval and that of crisis.

With this theory in mind, an examination of reticulocyte behavior has been made on a series of cases of lobar pneumonia in the University Hospital during the past winter and spring. We have been unfortunate in the fact that not a single typical case with "crisis" occurred, but the results obtained on the atypical cases are of such a nature that we consider our hypothesis as untenable. Hence we propose to terminate our investigation with this preliminary report, which we believe to be of value in the analysis of the obscure nature of crisis.

METHODS

Daily reticulocyte counts were done routinely on all cases of lobar pneumonia. *Table 1* gives the significant data. One case is presented in detail in *Table 2*, in which independent counts were made by two observers at short intervals during the crucial period of an expected crisis.

Two of the earlier cases with fatal termination showed a very low count and it was suggested that the reticulocyte count might be of prognostic value, but subsequent cases ruled out this consideration.

The general values vary considerably, but show no consistent relationship to the amount

Table 1

RETICULOCYTE COUNTS IN LOBAR PNEUMONIA, WITH OTHER SIGNIFICANT DATA

Date	Case	Involvement	W.B.C. (highest)	Hemoglobin Per Cent	Temperature (highest)	R.B.C. (lowest)	Ret. Per Cent	
October 23, 1931	50091 Male white 23	RUL LLL	42,000	60	106	3,740,000	0.0	Died
November 8, 1931	50407 Male white 40	LLL	82,500	60	103	2,600,000	0.1	At death
December 3, 1931	50646 Female white 52	RML LL	23,000	75	102	4,200,000	4.0	Died toxic myocarditis
November 29, 1931	50607 Female white 21	RLL	20,800	50	104	3,400,000	0.4	Died
December 4, 1931	50657 Female negro 40	RUL RML RLL	25,000	60	105	3,480,000	0.9	Died
March 10, 1932	77823 Female white 25	LLL	20,000	60	105	3,700,000	9.0	Died on third day
October 29, 1931	50339 Female negro 29	RLL LLL	28,300	75	102	3,500,000	0.8	
November 9, 1931	50699 Male negro 24	RLL	16,000	75	105	3,600,000	0.8	
November 30, 1931	50741 Male white 14	RML RLL	30,000	90	105	4,770,000	0.2	
October 30, 1931	50832 Female white 19	RUL Progressive	20,950	65	105	2,780,000	1.6	
November 30, 1931	76470 Female negro 14	LLL	16,500	50	105	3,880,000	0.9	
February 5, 1932	77382 Male negro 32	RLL	21,100	85	103	3,200,000	1.8	
November 21, 1931	76338 Male negro 20	LLL	34,000	60	106	3,600,000	0.8	
March 23, 1932	78038 Male white 13	RLL LLL LUL	36,800	65	105	2,442,000	0.3	
March 27, 1932	78099 Male white 21	LLL	12,000	72	105	4,280,000	3.0	
March 23, 1932	78047 Male white 50	RLL	24,650	65	104	3,400,000	0.8	
March 20, 1932	78018 Female white 45	LLL	16,000	75	104	4,000,000	4.0	

Table 2

RETICULOCYTE COUNTS DURING A CASE OF LOBAR PNEUMONIA WITH PSEUDOCRISIS

Case No. 77503. White male, age 16 years. Right lower and middle lobes.

2-14-32 Chill at 10 p. m.

2-15-32 Confined to bed with fever at home. Admitted to hospital at 6 p. m.

	W.B.C.	R.B.C.	Hem. %	Ret. %	Temp.
2-16-32	23,500	2,380,000	80	0.7	103 -105
2-17-32				0.3	102 -104
2-18-32	11 a. m.			0.3	102 -104
	2 p. m.			0.6	
	11 p. m.			0.5	
2-19-32	11 a. m.			0.5	103.6-104
2-20-32	11 a. m.			0.6	103 -104
2-21-32	1 p. m.			0.7	103 -102.6
	4 p. m.			0.5	
	10 p. m.			0.5	
2-22-32	10 a. m.			0.5	102.4-100
	4 p. m.			0.7	
	10 p. m.			0.3	
2-23-32	19,950	4,650,000	80	0.5	100.8- 98.4
2-24-32				0.4	99 - 98.6
2-25-32				0.4	98.6
2-26-32				0.3	98.6
3- 1-32	10,500	3,900,000	80	0.4	98.6
3- 9-32	Dismissed				

of involvement, degree of infection or severity of anemia. The values are consistent with those reported by Kugelmass and Lampe (1932).

The only finding of significance in this investigation on reticulocyte behavior is that the theoretical question of hematopoietic control through carbon dioxide or oxygen tension is again raised. We have previously discussed this point on the basis of data relating to the reticulocyte counts in the premature and still born (Krafka, 1931).

SUMMARY

(1) Reticulocyte counts have been made on a series of cases of lobar pneumonia with reference to their behavior during the crisis.

(2) No significant relationship was established between the crisis and hematopoiesis.

(3) Oxygen tension as the primary factor in hematopoietic control is called into question.

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A METHOD OF INSTRUCTING JUNIOR AND SENIOR STUDENTS*

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I wish to present for your consideration a method of teaching that we have been employing in the past year at Tulane University in the Medical Department. The method has to do with the instruction of the junior and senior classes which meet twice a week at the noon hour for a one-hour lecture period. The general principle that we employ has been used elsewhere in a somewhat different manner, but I do not know of any university medical school that is using this particular system exactly as we use it.

A word or two might be said concerning the why of this particular lecture course. Parenthetically, it might first be observed that in the past this hour has been given to systematic didactic lectures in medicine. It is a particularly appropriate time of day, as it is an hour in which it is impossible to use the students in the wards and clinics and sufficient time is given to them to do their laboratory work in the afternoons. It was felt that the didactic lectures are redundant and an unwise employment of the students' time. It is possible for lecturers in medicine to detail certain phases of medicine from first hand information, but there are certain diseases which, even when there are extensive hospital facilities, it is exceptional that the lecturer will have any contact with or opportunity of seeing. Certainly he will see them with such infrequency that it will be difficult for him to speak as one who is well acquainted with the disease in all its ramifications and manifestations. It is reasonable to assume that the didactic lecture then gives a lecturer an opportunity of importing direct information concerning only about 50 per cent of medical diseases, and this is a liberal estimate. Certainly it is impossible for a lecturer to be familiar with many of the unusual diseases or to have more than book knowledge of some of the rare expressions of the disease. The student can obtain information about these rare diseases probably better from the text-book

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*From the Department of Medicine, School of Medicine, Tulane University of Louisiana.

than he can from the spoken word of the lecturer. Furthermore, in a given time it is certainly possible to learn more by reading than it is by listening. The facts about a disease are expressed with greater care in a book than they are in a lecture. In a general way this represents the reason why it was felt advisable to discontinue formal didactic lectures in medicine, lectures which would cover the whole field of internal medicine. In order to cover the ground systematically, we have replaced the didactic lecture with more or less informal quizzes at which the student recites, asks questions and has explained to him any medical problem which is not clear or about which there might be some question.

To replace the formal didactic lecture, then, we have incorporated in our schedule a series of lectures which take up merely some particular phase of medicine. This particular lecture or talk is given in much greater detail than it would be possible to give it in the time allotted if the whole subject of medicine is to be covered in a given number of lectures. The lecturers speak on a variety of subjects and they are selected largely because of their interest in certain types of disease or in certain manifestations of disease or in any expression of disordered function. Some of the lecturers are extremely explicit, others generalize and present in a broad way the concept of the lecturer concerning the particular disease. The program is arranged at the beginning of each college year. The lecturers know the exact date on which they are to speak so that they have ample time to arrange a well thought out and well prepared presentation. In order to be more specific than I have been in the above paragraphs, I shall recite to you some of the titles of the lectures that were given in the past year. The first lecture of the year dealt with the "Specific Infections;" the second lecture with "Immunologic Processes in the Specific Infections;" then followed three lectures on "The Pathologic Physiology of Fever." The next talk was on "Present-Day Conception of Pneumonia," followed by the next session with a discussion of "Atypical Pneumonia." The succeeding lecture had to do with "The Diagnostic Criteria of Heart Disease" and then followed three talks on diabetes, the first hour being devoted to "The Handling of the Ambulatory Patient," the second to "Management of Diabetic Coma" and the third "The Surgical Complications of Diabetes." The next lecturer devoted an hour first to "The Care and Management of the Pneumonia Patient;" his next hour was given to "The Treatment of Pleurisy," and the third hour to "The Treatment of Asthma."

The Departments of Dermatology and Neurology and Psychiatry also participated in this lecture schedule. The next four Monday lectures were given upon dermatologic subjects, the first of which was "Secondary Infections in Skin Diseases;" the next on "Fungal Diseases of the Skin," and the last two were lantern demonstrations, the first presenting "Pictures of Secondary Syphilis" and the second "Pictures with Explanations of the Various Expressions of Leprosy." The Thursday lectures at the corresponding time of the month included a discourse on "Adult Diarrheas," followed by a presentation of "The Functional or So-Called Nervous Dyspepsia." Then "The Relationship of the Digestive Tract to Diseases in Other Parts of the Body" was followed by an hour's talk on the "General Aspects and Treatment of Digestive Disorders." The next three lectures had to do with infectious diseases, the first a very specific discussion of "Diphtheria as Observed at Charity Hospital;" the next hour was devoted to "Streptococcal Diseases" and the succeeding one to a discussion of "The Virus Diseases." The Thursday lectures for the next two months were devoted entirely to neurologic subjects. The titles of these lectures included such subjects as an "Approach to Neurologic Problems," "Birth Injuries of the Central Nervous System," the "Relation of the Endocrine System to Neurology," "Nervous Disorders Due to Drugs and Other Toxic Agents." These lectures were followed by two of a general nature, one having to do with "The Neuritides" and the next with "The Epilepsies." The next of the neurologic contributions was devoted to "Spasmic Conditions Other Than Epilepsy," followed by "The Neuralgias" and the following week by "The Scleroses." The succeeding Thursday lectures were also on neurologic subjects. The titles of these lectures were as follows: "The Syphilogenic Diseases of the Nervous System," "Myelomalacia and Encephalomalacia," "Vasomotor and Trophic Disorders," "The Diseases of the Extra-Pyramidal System," "Neurology of the Senium," "Infections Other Than Syphilis Involving the Nervous System," and last, "The Muscular Atrophies and Dystrophies."

The Monday lectures continued with general

medicine. The first Monday lecture in the year was entitled "Cardiac Mechanism Disturbances: Heart Failure of Various Types." Next week there was presented to the students a general discussion on "The Management of Patients with Heart Disease" and then followed a talk on "Vascular Disease, Aneurysm, Arteriosclerosis and Hypertension." The succeeding lecture had to do with "The Diagnosis and Treatment of Bacillary Dysentery," and it was followed by two on roentgenological subjects, the first being on "Indications and Limitations of Roentgenology" and the next one on "Radiation Therapy." The next lecturer gave two lectures, the first on "Allergy and Allergic Manifestations" and the following week a talk on "Spinal Puncture: Indications and Interpretation of Findings." The next two lectures were on subjects about which it is extremely difficult to get first hand information from text-books. The first was a lecture on "The Treatment of Minor Illnesses" and the next "Signs and Symptoms of Impending Death." These two lectures were followed by the subject, "The Uses of Blood Transfusion in Medicine," and this in turn was followed by a talk on "The Treatment of Malaria." The next three lectures were on the subject "The Disturbed Chemistry of Disease."

The Thursday lectures were now back again to subjects more applicable to general medicine than were the neurological subjects. The first of these lectures had to do with "The Mechanism of Jaundice." This was followed by a talk on "The Effect of Tropical Climates on the Clinical Picture of Certain of Our 'Cosmopolitan Diseases.'" The next lecture was on "Old Latent and Complicated Syphilis" and the next had to do with the "Differential Diagnosis of Coma." The last two lectures in this series had to do with the "Nephritides" and "The Classification and Disturbed Physiology of Kidney Disease."

This series of sixty lectures was given by twenty-four men in the Departments of Medicine and the associated Departments of Dermatology and Neurology. Some of the men gave only one lecture. The head of the Department of Medicine gave nine lectures. Most of the other lecturers gave theirs in groups of three.

It may be seen from recital of the program of this series of talks that there was a catholic selection of subjects. No effort was made to cover every phase of medicine and the men were asked to talk about things they were particularly interested in or about which they had made particular studies or investigations. One possible criticism of the various subjects was the rather over-stressing of the treatment of various diseases. In the minds of the students at least this is not a valid criticism. Always the student has complained that not enough time is devoted to the treatment of medical diseases. Much of the criticism of the lack of therapeutic teaching that has been expressed at various times is both right and just. There is no doubt that the student is instructed carefully in the pathology of disease, in disturbed physiology, in methods of recognizing disease and given rather detailed information as to the manifestations of various disease conditions, but there is lacking the detailed specific outline of treatment that the practitioner of years has gradually learned to apply in his practice.

Next year we are again giving a series of lectures of the same type. As the juniors of last year are the seniors of this year, the lecturers have selected new subjects to present to the junior and senior classes. These subjects show the same width and breadth of subject matter. Some of the lectures are broadly covered, others are detailed procedures of practice.

One of the main advantages of this method of teaching lies in the enthusiasm with which the lecturer will present a subject in which he is particularly interested and which may be one of his pet hobbies in medicine. This, of course, is advantageous to the student. The lecturers are enthusiastic and their enthusiasm is reflected in their presentation. The student hears and sees many more lecturers than he did in the past. There is not the same repetition by identically the same man speaking in his own characteristic way, which characteristic way may be fresh and stimulating for a few lectures, but which often becomes tiresome and boring to the hearer when repeated twice a week for thirty-two weeks.

The nearest approach that I know of to this method of presentation of the subject of medicine, in some of its many phases, is the custom which is practised in the University of Pennsylvania, where each Saturday a guest lecturer delivers to the senior class a talk on some subject in which he is particularly interested. This is possible in communities where there is a large population, where many doctors and teachers are available not only locally but from relatively near-by communities. Such a method is not

practical in New Orleans, where large cities are many hours away. I might say, however, parenthetically, that we do take advantage of a visiting prominent medical man to the city and try to get him to give clinics or to give one of our Monday or Thursday talks. Several times in the course of the year our schedule was interrupted by such visitors. The regularly scheduled lecturers gladly postponed to some other day their talk in order to give an opportunity to the distinguished visitor to speak at the time allotted to the medical school teacher.

SUMMARY

A method is outlined of presenting to medical students certain special aspects of medicine in detail, or of the discussing of some of the broad concepts of medicine. This is effected by a series of lectures given by various teachers in the Department of Medicine. The systematic and formal teaching of medicine is carried out by regular weekly quizzes so that the whole subject of medicine is fully covered but without didactic lectures on the subject.

DISCUSSION (*Abstract*)

Dr. C. C. Bass, New Orleans, La.—It is quite in line with general thought in the progress of medical education that students should be allowed to learn more and be taught less. We probably do entirely too much teaching and do not give students as much opportunity as they should have to learn. The didactic lecture certainly took up a great deal of the student's time; in fact, it wasted his time; and one thing that is being accomplished by changes in our curriculum is to allow the students more time to learn medicine in their own way or to do other studying. Students not only learn some facts while they are students in the medical school, but they also learn what is still more important, methods. If the methods they learn are good, they continue to use them and probably do not vary much throughout their subsequent career. Most of the facts they learn change; it is extremely difficult to distinguish them from the things that do not prove to be facts afterwards. It is unfortunate for students to devote all of their time, or too much of their time, to learning these so-called "facts" that the teachers are giving them and not to have enough time to learn good methods of study and good methods of practice.

As Dr. Musser has pointed out, instead of having the teacher rehash (sometimes very poorly, too) the ordinary textbook presentation of a case, or what is better presented in a textbook, he gives an outstanding presentation of some particular phase in the field in which he is especially interested. It is interesting to note the degree of success of this change, which has come about with us perhaps as rapidly as such changes can be made. It has been found that while a good many of the members of the faculty are able to fit into the idea there are others who are not yet able to avoid merely a textbook rehash that is really a waste of time. Although in the department of medicine probably most of the addresses or presentations are really worth while, I am sure there are a good many of them in some departments that are still a considerable waste of the time of the students and of the professor who presents them. No doubt this will improve as time goes on.

Dr. L. J. Moorman, Oklahoma City, Okla.—For two years, at the University of Oklahoma, we have had a similar plan in operation. The professor of medicine has chosen four to six members of the faculty, each, to give them three to six lectures to the juniors and seniors.

Dr. George Bethel, Galveston, Texas.—The idea that there is an excessive amount of didactic teaching in the medical curriculum is certainly not a new one. At the present time at the University of Texas we are in a state of flux in regard to our medical curriculum. We have appointed a revision committee and are reorganizing, planning to cut down the excessive number of didactic lectures. In studying this problem, however, the committee has realized that there are many angles to it. We have, however, done one thing; we have emphasized more than ever the clinicopathological conference. We have handled it in this way. These conferences are not held simply between the professor of medicine and the pathologist. For instance, on one Saturday morning the surgeon and the surgical staff will be present. Then we have the neurologist and his staff present, perhaps on another morning, the clinical findings, and correlate them with the pathological findings. Then we have the pediatrician, the psychiatrist and so on. In this way the various specialties in the school of medicine are correlated from the pathological standpoint. We find that intense interest is manifested not only by the staff but by the students, and it is one of the best attended conferences which the students have.

In their third and fourth years the medical students link the pre-clinical sciences with the clinical. This can be done not only by the clinicopathological conferences but also by such a course in applied physiology as Dr. Lyon has organized in the University of Minnesota. He tells me it is one of the most popular courses among the students. Of course, there again we should have more time for elective lectures and lectures other than by the staff.

Dr. J. Edwin Wood, Jr., University, Va.—Our lecture system at Virginia has recently been modified so that the members of our Department of Internal Medicine present subjects in their respective fields to the third year students.

However, we are not entirely favorable to formal lectures. In our experience the student of medicine benefits from his lecture course in proportion to his opportunity to contribute to the discussion. Recently we have permitted a student committee to function as the mouthpiece for the class. This group of young men canvasses the class to discover the various points which the professor has failed to make clear. At the end of a series of lectures the student committee is then in a position to stimulate promptly a profitable discussion.

Dr. Wm. deB. MacNider, Chapel Hill, N. C.—I suppose that Dr. Musser is correct in saying that the didactic part of teaching should be considerably curtailed, but I do not think it should be entirely given up. The only feeling I have of any certainty about teaching medical students (and I have been at it for thirty-

two years) is that if you are going to teach them you have to quiz them. That may be awfully old-fashioned. I do not mean, by quizzing them, to ask a question, and, on the student's answering it correctly or wrongly, to check it and go on to the next question; I mean a quiz carefully conducted and participated in by the whole class. My quiz may be on one or two questions or more and may last for an hour or longer. Very frequently the students ask that it be continued. I find that method is a very good one of getting across any subject to the students, and they enjoy it.

I have the feeling that the laboratories and the preclinical medical branches are tremendously marred because they do not give the student enough liberty. I aften ask them in the chemical laboratory what they are doing, and they say they are distilling. I ask them, for what, and they say: "Why, the guide says if you will take the distillate and put some PQ47 in it, it will turn green."

I think many laboratories are well nigh worthless because they are conducted in that way. But if you will turn the students loose, as in my subject, on the effects of a drug on a frog or a dog or on me, say you are introducing something into a living substance and try to explain what it does and what it does not do, then I think you strike fire. Quizzes are a very excellent method of interesting students, bringing out discussion, keeping them on their toes every day, and, equally important, of keeping the lecturer on his toes.

GRAPHIC ART AND ITS APPLICATION TO THE TEACHING OF MEDICINE: ANIMATED FILM*

By HARRY C. SCHMEISSER, M.D.,
JOSEPH V. CALTAGIRONE, M.D.,
and
JOSEPH L. SCIANNI, Artist,
Memphis, Tenn.

In the past few years animated motion pictures have been so universally accepted by the medical profession that the advisability of their use is no longer questioned. The general opinion is, however, that most of the motion pictures so far presented have been either crude through lack of knowledge of the best technic and policies for their production or they have been wanting in scientific accuracy and detail.

GRAPHIC ART

By graphic art is meant the figuration of anatomic form, apparatus and instrument by the use of a writing or painting medium. Any one or combination of the three common technics, (1) line, (2) tone, and (3) color, employed in graphic art, can be used in making practical medical illustrations, of which there are three major types: (1) schematic, (2) realistic, and (3) idealistic. These technics and types have been presented in detail and exemplified by illustrations in a previous paper.†

Animation.—Heretofore graphic art has been used mainly to supplement lectures and illustrate articles and books. Recently, with the introduction of motion photography it may be used in combination with the same in making animation, which is an attempt to portray motion by photographing a series of correlated illustrations.

APPLICATION OF GRAPHIC ART TO ANIMATION

The application of graphic art to animation requires a consideration of (1) studio equipment, (2) studio staff, (3) the technics employed in making illustrations for animation, and (4) the principles to be observed in animation.

Of primary importance is the studio and its equipment, the minimum of which might be considered a motion picture camera set-up with proper lighting such as Cooper-Hewitt mercury vapor lights, projector, animator's drawing board, dark room and printer, fire-proof closet for keeping films, sketch paper and other art material.

Of equal importance is the studio staff. The director, preferably a physician, must be well informed not only in medicine but also in the principles of fine art as well as in the making and taking of animated motion pictures. He is held responsible for the scientific accuracy of the film and is the final judge in problems that present themselves during its production. The chief animator, an artist, should become thoroughly acquainted with the subject to be animated because upon him rests the task of making the layout for the various "scenes" of the entire film. If an assistant animator can be had, he executes the details of the action in each scene as indicated in the layout. Tracers carefully ink and tone in all the illustrations indicated in pencil by the animator and his assistant. The photographer photographs the drawings one by one, following the order and instructions of the director and animator.

The graphic technic used in making illustrations for animation determines the degree of realism expected from the film. Pen and ink drawings schematically rendered with the use

*Read in Section on Medical Education, Southern Medical Association, Twenty-Fifth Annual Meeting, New Orleans, Louisiana, November 18-20, 1931.

*From the University of Tennessee, Pathological Institute, Art Department.

†Schmeisser, H. C.; and Scianni, J. L.: Art as Applied to Medicine. Jour. Tenn. Med. Ass'n., 19:311-315, March, 1927.

of flat tones in place of carefully graded shading is a simple and the most practical method. Line technic alone is still simpler, but not so artistic. The following three technics are used in making illustrations for animation: (1) "cut-out," (2) one-drawing one-frame, and (3) celluloid method. In the first, drawings are made, cut out, and moved across the field of photography according to need, as, perhaps, the movement of an instrument in and out of the field of operation. In the second, a complete new drawing is used for each frame. In the third, celluloid is used as a time-saving device. Its thinness and transparency permits two or even three "cells," each containing a part of an illustration to be superimposed upon each other and then photographed as a single frame. These methods may be used in combination.

Successful animation requires the application of certain principles, the most important of which we shall outline briefly.

The greatest attention should be given to the "scenario," which is an outline of the subject to be animated, treated scene by scene in proper sequence with emphasis on points of particular interest. It should be written and studied carefully by the director and animator before actual work on the film is begun.

By "footage" is meant the number of pictures or "frames" to the foot of standard size film, known as 35 mm. film. This number is constant, there being sixteen frames to one foot of standard film, which is projected in approximately one second at regular speed. Therefore, a reel holding one thousand feet of film contains 16,000 frames and is projected in 16 minutes and 40 seconds. Footage also implies the number of feet in a certain film. Some years ago Winsor McKay, the famous cartoonist, who is considered the father of practical animation, took the pains to make and photograph 16,000 consecutive drawings, thereby proving that the semblance of motion could be produced by this method. Bray, Hurd, Colby and others following him, through trick photography, have cut down the number of drawings required for a certain footage and have produced greater smoothness of action.

Our reel has a footage of 500 feet, contains 8,000 frames and requires 8 minutes and 20 seconds to project.

"Timing" of action represents the speed with which a certain movement is made. The importance of the timing factor is obvious. This timing is relative, and rarely shows the actual time of a movement. If a movement is represented by too many drawings, the action, when projected onto the screen, will appear to drag and will be tiring to the observer; if the movement is portrayed by an insufficient number of drawings, it will appear "jerky" and flickering will result.

"Balloons" or brief legends on separate pieces of paper with arrows or leads to the points of interest can be used to make clear the subject matter.

APPLICATION OF ANIMATION TO THE TEACHING OF MEDICINE

Let us consider briefly, (a) where, (b) how films should be used in the teaching of medicine.

Films should be used in teaching the fundamental sciences, where facts are more or less fixed, as in anatomy; also in clinical subjects where facts and principles are again more or less fixed as in normal obstetrical delivery. Films are less desirable where technics and procedures are constantly subject to change, for example, the technic for removing a particular organ from the body.

The accepted pedagogical methods should prevail during the teaching of a subject. The film should be used to supplement. Take, for example, "normal delivery." After the students have studied the different stages, a film might be shown in order to give a vivid and continuous visual impression of these stages.

SUMMARY AND CONCLUSIONS

(1) The essentials of graphic art, how graphic art may be applied in the making of animation, and where and how animated films may be used in teaching, have been discussed.

(2) In straight motion photography only what is exposed to view can be recorded and conditions cannot always be made favorable for desired results.

(3) Possibilities of animation are unlimited because fields which cannot be exposed to view can be animated and physical conditions can be made to suit the problem on hand.

(4) It is not proposed to discard straight motion photography, but rather to interpolate animation where the former fails.

(5) It is not intended that motion pictures, straight or in animation, displace the presently accepted methods of teaching, but that it be used as an aid to these methods.

(6) The motion picture becomes particularly desirable during the review of a given subject.

(7) The existing small number of practical films is due not so much to cost as to the scarcity of producers qualified both in teaching and animation technic.

(8) The quality of a film is determined by, (1) its educational value or appropriateness, (2) scientific value or information imparted, and (3) artistic value, its beauty.

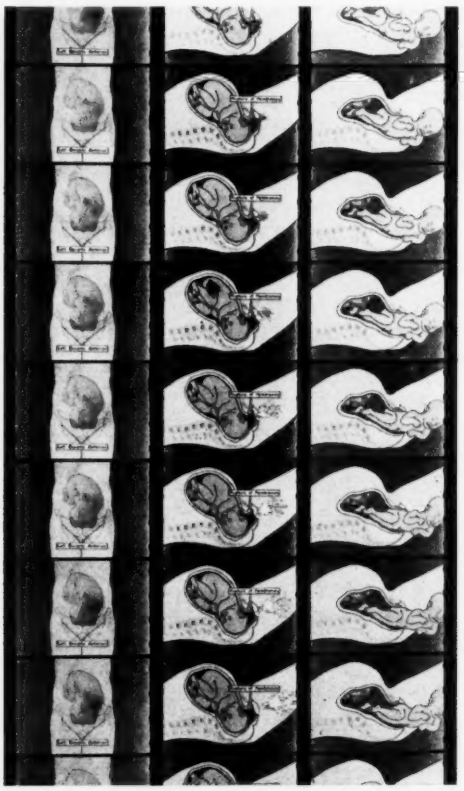

Fig. 1 Fig. 2 Fig. 3

Animation.

Fig. 1. Heart sounds indicating left occiput anterior fetal presentation.

Figs. 2 and 3. Normal left occiput anterior delivery.

OUR FILM

Our film shows examples of: (a) three common technics employed in graphic art, (1) line, (2) tone, (3) color.

(b) Three types of practical medical illustrations: (1) schematic, (2) realistic, (3) idealistic.

(c) Animation, the combination of graphic art and motion photography of (1) several common heart sounds indicating fetal presentation (*Fig. 1*); (2) normal left occiput anterior delivery (*Figs. 2* and *3*).

DISCUSSION (*Abstract*)

Dr. Stuart Graves, Tuscaloosa, Ala.—I should like to ask Dr. Schmeisser the approximate cost of the original permanent equipment, and, second, the approximate cost of maintenance. Of course, I understand that would depend upon the output. Thirdly, about what would be the approximate cost of such a film as we have just seen? Fourthly, have any plans been considered for the supplying of such films to other schools?

Dr. W. T. Dawson, Galveston, Texas.—Some years ago we made a film in Phi adelphia of heart block in a man who had had six ribs out on the left side. The film ran for about fifteen minutes; the length was between 800 and 900 feet They would have charged us at that time one dollar a foot for the film if produced commercially. I think the cost would be less now.

Dr. Schmeisser (closing).—I am afraid I cannot with any accuracy state the actual expense of making this film. One thousand dollars was paid for material, fees to tracers and to the Bray Studio of New York for photographing and finishing the fi'm. The time spent by Dr. Caltagirone and Scianni writing the scenario, planning and making the many illustrations, and supervising the photographing of the film is not included in the above figure.

I am also unable to state the expense of equipping the Art Department of our Pathological Institute. It has been done over a period of seven years, and is now well equipped to execute all kinds of medical illustrating: clinical photography; anatomical photography, gross and microscopic; photography of charts; colored photography; straight and animated motion pictures photography; free-hand illustrating in line, color and tone, gross and microscopic; and the making of lantern slides. We also have a special steel frame for supporting the camera and photographer over the autopsy table. The cost of supplies for photography is small and for the graphic art less. The expense is in the equipment and salary to the artist. The supplying of this film to other schools has not yet been considered.

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EDITORIAL DEPARTMENT

SOUTHERN MEDICAL ASSOCIATION
Twenty-Sixth Annual Meeting
Birmingham, Alabama, November 16-18, 1932

THE BIRMINGHAM MEETING

The value of any medical meeting is in direct proportion to the stimulation received from it.

In times of business apathy one loses little from an absence of a few days from practice. On the other hand, the programs of the Southern Medical Association have become progressively better than in former years when it seemed next to impossible at times to get away from the urgent demands of professional duties.

From a former four-day session the meeting has been condensed to one day of general clinics plus two days for section papers. Thus the time away from home will not be long, whereas the change of environment, the contact with old friends, the making of new acquaintances, and the acquisition of new data on the various problems of medicine, make any medical meeting of great value. However, a striking difference is always observed at meetings of the Southern Medical Association, namely: there is a friendliness and cordiality not found at similar gatherings elsewhere. Furthermore, the informality that enables one to discuss papers without prearrangement is always as agreeable as it is surprising to newcomers.

Many physicians state that the Southern Medical meetings are the most inspiring and helpful of any which they attend.

A great deal of time and effort has been expended in building the general clinics and section programs so that they will comprise a short postgraduate course in medicine. This gathering will offer a rare opportunity for hearing from those best qualified to discuss them the worthwhile advances in the practice of medicine, surgery and the other specialties. The Southern Medical Association is made up of more sections than any medical organization in the world.

Railway rates are now the cheapest in many decades; bus fares are also low; automobile roads into Birmingham are good in all directions; and the Airport is modern in every respect. The central location of Birmingham in the territory of the Southern Medical Association makes it accessible by any of these four means of travel from all parts of the South.

It is not too early to begin thinking of the meeting of the Association next November 16 to 18 in Birmingham. Every Southern physician should see to it that nothing shall prevent his attending this meeting.

BARBITURATES

Few things are so important to the comfort of the surgical patient as the anesthetic. This and the removal of the stitches are sometimes said to loom largest in the patient's memory and reports of his operation. The use of the barbiturates in surgical and obstetrical cases is now very general. There is a large number of these derivatives on the market, and with slight changes in their structural formulae rather different narcotic effects are produced. Fulton and Keller,[1] of Yale University, have made a study and record of the speed of anesthetization and recovery of three different barbiturates given to the same chimpanzee at intervals of several weeks, which allowed the animal completely to recover from each operation.

In each case the animal was very violent at the time of injection of the anesthetic and had to be held by five men. The first drug used was di-allyl-barbituric acid, or dial Ciba. The animal was sleeping quietly in twenty minutes after the first injection, though about an hour and a half was required before he was ready for operation without ether. Thirteen hours later he could not be aroused. After thirty-four hours he was still dazed, not sitting up. At the sixty-first hour he was sitting up, but slow of movement.

1. Fulton, J. F.; and Keller, A. D.: Observations on the Response of the Same Chimpanzee to Dial, Amytal and Nembutal Used as Surgical Anesthetics. Surg., Gyn. & Obst., 54:765, May, 1932.

It was not until the seventy-second hour, in other words, after three days, that he had become alert and obstreperous again. Another chimpanzee which was given dial required approximately the same length of time to recover.

Seven weeks later sodium amytal was given to the chimpanzee. The animal was well under the anesthetic in less than ten minutes, though all reflexes were not abolished. He slept quietly until the thirteenth hour, when his head was supported and he drank milk. In twenty-four hours he was up, normal but subdued. In thirty-one hours, that is, in little more than a day and a night, he was alert, quick and obstreporous again, eating freely. The periods of induction and of recovery were thus shortened with this drug.

The third barbituric acid derivative tried on this animal was sodium-ethyl-l-methyl-butyl-barbiturate, or nembutal. The animal was completely relaxed and in fairly deep surgical anesthesia in six minutes. He began to recover in two hours. The notable effects of this drug were the great speed of induction and recovery. Recovery occurred in approximately half the time required for recovery from sodium amytal. The effect on respiration was at times slightly alarming. In decreasing order of rate of induction of anesthesia and rate of recovery the drugs examined ran (1) dial, (2) sodium amytal, and (3) nembutal. Dial was recommended by the authors for operations on the higher apes in which it is desired to keep the animal quiet for several days. It was suggested for humans in maniacal excitement, since animals remained narcotized for twenty-four hours after taking it, and for eighteen or twenty more were quiet, although able to take fluids freely by mouth. Nembutal they report as almost an ideal anesthetic.

Recovery from all three drugs is quicker, they say, in a moist than in a dry atmosphere.

Hobbs,[2] of St. Louis, who has used allyl-iso-propyl-barbituric acid, or numal, in obstetrics, reports that it induces sleep in human beings in two minutes and causes no liver damage.

These drugs are among the triumphs of synthetic chemistry, since by variations in a basic formula a large number of substances is produced for swift or slow anesthesia, according to the needs of the physician. The not infrequent fatalities in animals from overdosage should not be forgotten, and care should always be used in prescribing them.

2. Hobbs, J. E.: Use of Allyl-iso-propyl Barbituric Acid in Labor. Sou. Med. Jour., this issue, pages 852-856.

GLEANINGS FROM RECENT JOURNALS

Treatment of Experimental Ileus.—For absorption of fluids and some nutriment from the lower bowel, the use of very dilute or hypotonic solutions is most effective.[1] For stimulation of contractions in intestinal obstruction, hypertonic solutions of several types have been given intravenously. According to Ochsner, Gage and Cutting,[2] of Tulane University, New Orleans, who have made a series of observations upon unanesthetized normal animals and upon animals with experimental ileus, certain of the hypertonic solutions are considerably better than others. Twenty per cent sodium chloride solution intravenously administered, for example, brought about an increase of intestinal contractions in about 90 per cent of the animals so treated. One-half of 1 per cent potassium chloride added to the hypertonic saline reduced its effectiveness. This solution stimulated contractions in only 83 per cent of the animals which received it. Hypertonic Hartman's solution brought about an increase of peristalsis in 95 per cent of cases, and a concentrated or hypertonic solution of Ringer's mixture resulted in increase of motility of 97 per cent of the animals.

Administration of fluids by non-oral routes is one of the most valuable measures of postoperative care. It is necessary to choose carefully one's salt and one's salt concentration according to the purpose for which it is intended. For administration of fluids in uncomplicated surgical cases, certain weak hypertonic solutions, solutions with osmotic pressure lower than that of the blood, through the rectum, are advisable. For combating intestinal obstruction, concentrated and very hypertonic solutions of sodium chloride or Ringer's mixture are probably most efficacious.

Pyelographic Media.—When methods of blood chemical analysis first came out, such large samples of blood were necessary for each determination that for examination of more than a few constituents the patient had to be very nearly exsanguinated. The technic was shortly improved so that now very small specimens can give information about a variety of constituents. Urological methods have similarly been improved, so that they are increasingly harmless to the patient, and of wider and wider applicability.

1. Ed., Sou. Med. Jour., 1932, pages 673-674.
2. Ochsner, A.; Gage, I. M.; and Cutting, R. A.: Treatment of Experimental Ileus by Hypertonic Saline Solutions. Proc. Soc. Exper, Biol. & Med., 29:911, May, 1932.

The early technic of pyelographic examination gave urologists very leading information in the study of the bladder, kidneys and ureters, yet was often exquisitely painful to the patient.

Pain and injury from pyelographic media are often accredited merely to overdistention of the bladder and kidney pelves from the injection of too much of the opaque solution. It has also been said that the injury is caused by hypertonicity of the solution. Graves and Davidoff[3] noted that if certain solutions were injected into the kidney from above, the bladder lost its powers of contractility. There appears to be a specific effect of the salt which is dissolved, as well as of its concentration in relation to the osmotic pressure of the blood. Mark and Johnson,[3] of Kansas City, have compared specimens of bladders after injection from below of normal saline, 12.5 per cent sodium iodide, 25 per cent sodium bromide, 30 per cent iopax, and 20 per cent skiodan, being careful in each case not to overdistend the bladder. They also compared the hemolytic effects of these five solutions upon the red blood cells.

The bladder mucosa after normal saline was not injured. After sodium iodide the mucosa was intact, but there were notable edema and congestion of the submucosa. After contact with sodium bromide, the bladder mucosa was destroyed.

3. Mark, E. G.; and Johnson, E. T.: Jour. Urol., 27:593, May, 1932.

Book Reviews

Psychology and Psychiatry in Pediatrics: The Problem. Report of the Subcommittee on Psychology and Psychiatry, Dr. Bronson Crothers, Boston, Chairman. White House Conference on Child Health and Protection. 146 pages with tables and charts. New York: The Century Company, 1932. Cloth, $1.50.

This report discusses psychology and psychiatry in relation to pediatric practice. The material has been derived from questionnaires sent to medical schools, pediatrists, social service workers, mental hygienists and general practitioners. They feel that the well being of an individual depends upon mental as well as physical factors and that the physician should be able to administer to both competently. Unless this is done this work will probably fall into non-medical hands. It is a real challenge to the pediatrician and general practitioner.

Growth and Development of the Child. Part III: Nutrition. Report of the Committee on Growth and Development, Kenneth D. Blackfan, M.D., Boston, Chairman. White House Conference on Child Health and Protection. 532 pages with tables and charts. New York: The Century Company, 1932. Cloth, $4.00.

This volume contains a careful analysis of nutrition in relation to growth and development of the child. The value of each food substance is carefully appraised and its inclusion in the average diet is freely discussed. Every dietary factor is handled thoroughly and competently, including carbohydrates, fats, proteins, vitamins, minerals, salts, rare elements and finally water.

Metabolism and the energy requirements of children are taken up and fully elucidated. The final chapters are on feeding habits and the psychological factors in feeding children. Condensed in this text is a careful compilation of modern dietetics and nutritional knowledge clearly and thoughtfully explained. It is an excellent book.

Health Protection for the Preschool Child. A National Survey of the Use of the Preventive Medical and Dental Service for Children Under Six. Report to the Section on Medical Service. George Truman Palmer, Dr.P.H., Chairman, Subcommittee on Statistics; Mahew Derryberry, Research Assistant; and Philip Van Ingen, M.D., Chairman, Committee on Medical Care for Children. White House Conference on Child Health and Protection. 275 pages with tables, charts and illustrations. New York: The Century Company, 1931. Cloth, $2.50.

The data collected here attempts to determine to what extent the health of sixteen million preschool children is protected. The survey actually reached about one hundred and eighty-three thousand children, 20 per cent of whom were rural. Four main questions furnish the basis for the conclusions: (1) Has the child had a health examination? (2) Has the child had a dental examination? (3) Has the child been vaccinated? (4) Has the child been immunized against diphtheria?

The collected material has been tabulated and summarized. Several valuable conclusions have been derived from this work, which is a worthy contribution to preschool literature.

Body Mechanics: Education and Practice. Report of the Subcommittee on Orthopedics and Body Mechanics to White House Conference on Child Health and Protection, Robert B. Osgood, M.D., Chairman. 166 pages with tables, charts and illustrations. New York: The Century Company, 1932. Cloth, $1.50.

The first part of this report is devoted to the program of the subcommittee with an explanation of terms, methods of instruction and the conclusions which are derived from the tables set forth in the appendix.

Appendix I is a reprinted Government publication on posture and physical fitness. Appendix II is an outline of the physical education program of the Boston, Massachusetts, elementary schools. Appendix III lists the questionnaires which were sent out. The book carefully covers the question of posture training in the United States.

Dermatology and Syphilis. Edited by Fred Wise, M.D., Professor of Dermatology and Syphilology, New York Postgraduate Medical School and Hospital of Columbia University, and Marion B. Sulzberger, M.D., Associate in Dermatology and Syphilology, New York Postgraduate Medical School and Hospital of Columbia University. Urology. Edited by John H. Cunningham, M.D., Associate in Genito-Urinary Surgery, Harvard University Postgraduate School of Medicine. 472 pages with illustrations. Chicago: The Year Book Publishers, Inc., 1932. Cloth, $2.25.

The section on dermatology and syphilis is in the hands of two new editors. Both sections follow the same plan of previous editions, i. e., they embrace the more important work of 1930 in dermatology, syphilis and urology. The editorial comments are succinct and helpful. The material has been selected to interest the general practitioner.

General Therapeutics: The Practical Medicine Series. By Bernard Fantus, M.S., M.D., Professor of Therapeutics, University of Illinois College of Medicine; Member, Revision Committee United States Pharmacopeia and of National Formulary Revision Committee, and Louis B. Kartoon, B. S., M.D., Instructor of Medicine, University of Illinois College of Medicine. 467 pages with tables and illustrations. Chicago: The Year Book Publishers, 1932. Cloth, $2.25.

Many new ideas are expressed in this volume and some of the old have become crystallized. Among the endocrines, "Cortical Hormone" ranks in importance. Other endocrine actions are the use of the anterior pituitary extract in baldness and the simplification of the Aschheim-Zondek test into a routine laboratory procedure.

Mucin in the treatment and prevention of gastric ulcer has been tried with good results, even in obstinate cases. The liver extracts by injection in selected cases and the iodides in hypothyroidism are worthy of trial.

The abstracts on physiotherapy bring out the more recent uses of pyretotherapy. The roentgen radiation is now being used in the treatment of inflammatory processes as well as other conditions. A complete picture of therapeutic advance is furnished by the collection of abstracts which make up this book.

The Youngest of the Family: His Care and Training. By Joseph Garland, M.D., Physician to Children's Medical Department, Massachusetts General Hospital; Consulting Pediatrician, Massachusetts Eye and Ear Infirmary; Instructor in Pediatrics, Harvard Medical School. 196 pages with tables, charts and illustrations. Cambridge: Harvard University Press, 1932. Cloth, $2.00.

This is a handbook for the guidance of mothers in raising the child from birth to the toddle age. The topics discussed are growth and development, care and training, breast and bottle feeding, care of the premature baby, general health, minor ailments, and the runabout age. Exception can be taken to the statement that "pin worms are harmless." The literature contains several cases where they are reported as the etiological factor in appendicitis. Besides they are very annoying. In the main the book is quite sensible and will help the young mother with her difficulties.

Text-Book of Massage and Remedial Gymnastics. By L. L. Despard, Member Chartered Society of Massage and Medical Gymnastics. With two chapters contributed by Hester S. Angove, Member Chartered Society of Massage and Medical Gymnastics; Sister-in-Charge of the Massage Department, Guy's Hospital, London. Third Edition. 474 pages with tables, charts and illustrations. New York: The Oxford University Press, 1932. Cloth, $6.00.

The first part of this book consists of an abridgement of human anatomy. Special emphasis is given to the muscular system. This section is illustrated by cuts from Cunningham.

Part two takes up massage, the Swedish classification of movements being given. An additional chapter on the re-education of muscles has been inserted, several chapters have been rewritten and numerous revisions have been made. Special chapters on massage in cardiovascular and respiratory disease are included. According to the author, practically every disease condition may be helped by massage. The book shows an enthusiasm which is commendable, but there is an apparent lack of basic medical knowledge. The physician should familiarize himself with this form of mechanotherapy as a useful adjunct.

Report of Committee on Standard Practices in the Problem of Compensation of Occupational Diseases of the Industrial Hygiene Section of American Public Health Association. Dr. Henry H. Kessler, Chairman. 124 pages with tables and charts. New York: American Public Health Association, 1931. Price, $1.50.

The existing data on occupational disease compensation are collected and tabulated in this report. The statistics are grouped according to their origin, Continental Europe, South America, Central America and Mexico, Britain and British colonies and the United States.

Each group of statistics is followed by a summary of the laws and an explanation of the administration of those laws. In the United States the existing laws vary greatly. Four states do not have compensation laws, while New York State allows compensation if the claimant thinks he has been hurt.

The work of this Committee should be read by every legislative body and industrial surgeon. There is no doubt that existing laws could be modified to be fairer both to employer and employe.

Psyllium Seed: The Latest Laxative. By J. F. Montague, Medical Director, Montague Hospital for Intestinal Ailments. 170 pages with 20 illustrations. New York: Montague Hospital for Intestinal Ailments, 1932.

Dr. Montague, in this instructive monograph, discusses the history, characteristics and properties of psyllium seed. He tells that the plant was considered a weed in Europe, though it was included in the medieval pharmacopeia. The growing popularity is traced and then ensues a discussion of the different varieties, white and brown, the habitat of each and various substitutes which have been offered. Case reports are given and comparison is made with mineral oil and bran. The subject is well covered and quite conservative.

Courts and Doctors. By Lloyd Paul Stryker. 236 pages. New York: The Macmillan Company, 1932. Cloth, $2.00.

The relationship of doctor, patient and the law are demonstrated and explained in this volume. The author draws on the experience of many years to set forth eleven rules for the reducing of malpractice suits to the minimum. Legal verbiage is defined so simply that the text is very easy to master. A practitioner owes himself the confidence that a knowledge of medical law will give him. This book offers a pleasing method of its acquisition.

The Expectant Mother's Handbook. By Frederick C. Irving, A.B., M.D., Professor of Obstetrics, Harvard Medical School; Visiting Obstetrician, Boston Lying-In Hospital. 203 pages with tables and illustrations. Boston: Houghton Mifflin Company, 1932. Cloth, $1.75.

This handbook answers the more common questions about motherhood and dispels some of the fallacies which abound. The scientific terms are explained fully and with frankness. The discussion includes the anatomy of the organs of reproduction, conception, the diagnosis and growth of the fetus, the hygiene of pregnancy, diet, major and minor complications, preparations for the baby, labor, anesthesia, obstetrical operations and the biological aspects of pregnancy. The book in the hands of the expectant mother will aid in raising the standard of prenatal care and give the physician a more cooperative patient.

Southern Medical News

ALABAMA

Dr. Seale Harris, Birmingham, was elected President and Dr. W. J. Love, Opelika, was reelected Secretary and Treasurer of the Chattahoochee Valley Medical and Surgical Association at its recent annual meeting in Albany, Georgia.

Dr. L. L. Hill, Jr., Montgomery, received the postgraduate degree of Master of Science in Surgery from Tulane University School of Medicine, New Orleans, Louisiana, at their recent commencement.

Dr. George O. Wallace, Bakerhill, recently presented to the Barbour County Medical Society a portrait of the late Dr. James W. Robertson, Clayton, a past President of the Society.

Dr. W. T. Fales, Montgomery, Director of the Bureau of Vital Statistics of the State Health Department, has returned to his offices at the State Health Department after a year's leave of absence, which he spent in Bucharest supervising the establishment of a Bureau of Vital Statistics for the Government of Roumania.

Dr. Joseph B. Graham, formerly of Richmond, Virginia, has located at Talladega, where he will practice general surgery.

Deaths

Dr. Asa Price Martin, Cullman, aged 59, died May 27 of organic heart disease.

Dr. Doc. J. Parker, Birmingham, aged 62, died March 27 of heart disease.

Dr. B. Walne Watson, Pineapple, aged 65, died May 9 from accidental drowning.

ARKANSAS

Hempstead, Nevada and Clark Counties have organized a Tri-County Clinical Society, which will meet monthly, alternating in the three counties. The following officers were elected at the organization meeting for the coming year: Dr. C. K. Townsend, Arkadelphia, President; Dr. S. J. Hesterly, Prescott, Dr. H. A. Ross, Arkadelphia, and Dr. L. M. Lile, Hope, Vice-Presidents; and Dr. A. S. Buchanan, Prescott, Secretary-Treasurer.

Dr. F. Walter Carruthers, Little Rock, has been reappointed by the Governor for a term of five years on the Arkansas Crippled Children's Commission.

Dr. A. C. Shipp, Little Rock, has been elected permanent Chairman of the Administration Committee of the Arkansas Division of the White House Conference on Child Health and Protection.

Members of the faculty of the School of Medicine, University of Arkansas, and the Pulaski County Medical Society recently attended a reception given by Dr. Frank Vinsonhaler, Little Rock, Dean of the Medical School, in honor of Dr. Edward H. Cary, Dallas, Texas, who was in Little Rock to address the graduating class of the School of Medicine.

Dr. Paul H. Power, Pine Bluff, is studying diseases of the skin in the New York Skin and Cancer Hospital, where he has accepted an internship.

Dr. S. C. Grant, Mulberry, recently entertained with a dinner in honor of Dr. F. Walter Carruthers, Little Rock.

The Sebastian County Medical Society and the Pulaski County Medical Society met in Little Rock in May jor a joint session.

The Fort Smith Clinical Society met in June for its fifth session, this meeting being sponsored by the clinical staffs of Saint John's, Sparks Memorial and Saint Edwards Mercy Hospitals.

Deaths

Dr. Joshua P. Beasley, Waldo, aged 70, died April 28 of cerebral hemorrhage.

DISTRICT OF COLUMBIA

Dr. Guy W. Leadbetter, Washington, has been elected President of the Medical Society of Maryland, Virginia and District of Columbia at its meeting recently in Norbeck, Maryland.

The National Milk Commission met in Washington during May.

District of Columbia members of the Pan-American Medical Association recently organized to represent the Association locally, and elected the following officers: Dr. Hugh S. Cumming, President; Dr. J. M. Puig, Casauranc, Vice-President; Dr. Jose G. Lewis, Vice-President; and Dr. Aristides A. Moll, Secretary.

Dr. Mary O'Malley, Washington, was elected a Vice-President of the Medical Woman's National Association at its meeting in New Orleans.

Dr. Edmund Horgan, Washington, has been appointed by the American Medical Association to represent the Association at the British Medical Association, which convened in London in July.

The Committee on Civic Health of the Medical Society of the District of Columbia, with the aid of volunteer physicians, has established a temporary clinic at the so-called Bonus Army camp for the protection of public health.

The Children's Hospital, Washington, has discontinued its undergraduate school, effective April 1.

Newly elected officers of the Scientific Sections of the Medical Society of the District of Columbia are as follows: Section on Pathology and Laboratory Medicine: Dr. Eugene R. Whitmore, Chairman; Dr. Tomas Cajigas, Vice-Chairman; and Dr. H. H. Leffler, Secretary-Treasurer. Section on Internal Medicine: Dr. Stuart O. Foster, Chairman; Dr. James W. Esler, Vice-Chairman; and Dr. B. W. Leonard, Secretary-Treasurer. Section on Nervous and Mental Diseases: Dr. Percy Hickling, Chairman; Dr. Dexter M. Bullard, Vice-Chairman; and Dr. Walter Freeman, Secretary-Treasurer. Section on Ophthalmology and Otolaryngology: Dr. Albert P. Tibbets, Chairman; Dr. J. Beaty Griffith, Vice-Chairman; Dr. G. Victor Simpson, Secretary; and Dr. John H. Trinder, Treasurer.

The newly organized Section on Neoplastic Diseases has elected the following officers: Dr. Eugene R. Whitmore, Chairman; Dr. Oscar B. Hunter, Vice-Chairman; Dr. H. H. Leffler, Secretary-Treasurer; Dr. Edmund Horgan and Dr. E. A. Merritt, Executive Committee.

Deaths

Dr. William Williams Keen, Philadelphia, aged 95, honorary member of the Medical Society of the District of Columbia, died June 7.

Dr. Silvanus Blanchard Newton, associate member of the Society, died April 30.

Dr. Clarence Henry Howland, D.D.S., aged 77, an associate member of the local medical Society, died June 4.

FLORIDA

The Florida Radiological Society held its semi-annual meeting recently in Sarasota and elected the following officers for the coming year: Dr. O. O. Feaster, St. Petersburg, President; Dr. Frederick K. Herpel, West Palm Beach, Vice-President; and Dr. W. M. Shaw, Jacksonville, Secretary-Treasurer.

Dr. F. F. Kumm, formerly of St. Petersburg, has moved to Minneapolis to practice medicine.

Dr. Spencer A. Folsom, Orlando, is taking a course of study in cardiology in Pittsburg, Pennsylvania.

Dr. Gaston Day, Jacksonville, has moved into new offices, where he will limit his practice to anesthesia.

Dr. C. C. Rudolph, St. Petersburg, has been doing postgraduate work in Washington.

Dr. Homer L. Pearson, Miami, represented the Dade County Medical Society at the National Milk Commission in Washington.

DEATHS

Dr. Thomas Lenwood Bennett, Palm Beach, aged 63, died May 9 in a New York hospital of pulmonary embolism.

Dr. John Charles Fremont Hutton, Clermont, aged 71, died April 25 of angina pectoris.

Dr. Jeremiah Noble Hankins, Milton, aged 52, died May 20 of chronic myocarditis.

GEORGIA

Newly elected officers of the Georgia State Medical Association are as follows: Dr. Marvin M. Head, Zebulon, President; Dr. C. H. Richardson, Macon, President-Elect; Dr. A. A. Morrison, Savannah, First Vice-President; Dr. D. H. Garrison, Tate, Second Vice-President; and Dr. Allen H. Bunce, Atlanta, Secretary-Treasurer.

The Eye, Ear, Nose and Throat Club of Georgia met in Savannah in May and elected the following officers for the coming year: Dr. Thomas H. Hall, Macon, President; and Dr. J. Allen Smith, Macon, Secretary-Treasurer.

The Chattahoochee Valley Medical and Surgical Association met at Radium Springs, Albany, in July.

Dr. R. H. Oppenheimer, Dean of Emory University Medical School, has announced that surgical clinics will be held in the operating room of the Emory Division of the Grady Hospital each Saturday morning beginning July 2.

Dr. Jack C. Norris, Decatur, Pathologist to Grady Hospital, is spending several months in study at the University of Chicago Department of Pathology.

The Georgia Urological Society held its third annual meeting in Savannah in May, during the meeting of the State Association. Officers elected for the following year are: Dr. Ernest Corn, Macon, President; Dr. William Shearouse, Savannah, President-Elect; and Dr. Allen F. Caldwell, Atlanta, Secretary-Treasurer.

The Fulton County Milk Commission recently gave a symposium on "Certified Milk" at the Academy of Medicine in Atlanta.

DEATHS

Dr. Henry B. Wright, Gainesville, aged 42, died May 6 of cerebral hemorrhage.

Dr. Joseph M. Tribble, Lithonia, aged 67, died May 20 in an Atlanta hospital.

Dr. Charles M. Chamlee, Adairsville, aged 57, died May 11 in an Atlanta hospital of carcinoma of the lungs.

Dr. John Wesley Gillespie, Albany, aged 69, died May 20 of senile dementia.

Dr. John B. Barwick, Blythe, aged 82, died May 25.

Dr. Sterling Price Holland, Blakely, aged 51, died May 29.

KENTUCKY

The annual postgraduate course sponsored each summer by the Kentucky State Medical Association was held in June at City Hospital, Louisville, with Dr. Charles W. Hibbitt as Chairman of the Committee for arranging the course.

Louisville's second free cancer clinic was opened recently at St. Joseph's Infirmary. Dr. Irvin Abell, with a staff of twenty-four assisting physicians, will give free diagnostic service.

Dr. James O. Nall, Murray, and Miss Florence Phillips were married June 4.

DEATHS

Dr. L. Emory Comstock, Horse Cave, aged 59, died May 22 of septicemia.

Dr. Benjamin T. Hall, Benton, aged 79, died May 27 of acute dysentery.

Dr. John T. Boldrick, Lebanon, aged 47, died May 6 of cerebral hemorrhage.

Dr. Everett Layton Pirkey, Louisville, aged 48, died May 16 of heart disease.

Dr. Raymond Wale Meador, Irvington, aged 52, died April 18 of cerebral hemorrhage.

Dr. Woodson T. Merchant, Louisville, aged 70, died May 13.

Dr. Green V. Daniel, Paintsville, aged 66, died April 6 in an Ashland hospital.

LOUISIANA

The U. S. Quarantine Station at Algiers, recently constructed from a Congressional appropriation, and which has been in operation since last fall, was formally opened during the annual meeting of the American Medical Association in New Orleans in May.

The Louisiana Society for the Prevention of Blindness, at its recent annual meeting at Touro Infirmary, elected the following officers for the coming year: Dr. Charles A. Bahn, New Orleans, President; Nicholas Bauer, William A. Shuler and Miss Florence Loeber, Vice-Presidents; Rabbi David Fichman, Treasurer; and Mrs. Mary Cross King, Executive Secretary.

Physicians of St. Charles, St. James, St. John and Jefferson Parishes met recently in Hahnville and organized the Second District Medical Society. The following officers were elected: Dr. J. S. Kopfler, Kenner, President; Dr. L. T. Donaldson, Hahnville, Vice-President; and Dr. L. O. Waguespack, Vacherie, Secretary-Treasurer.

The Tulane Alumni Dinner was given recently at the Roosevelt Hotel with 125 members in attendance, representing practically every Southern state. Dr. Rudolph Matas, New Orleans, was the principal speaker.

DEATHS

Dr. Zachary Taylor Young, New Orleans, aged 47, died May 9.

Dr. Baxter Staples Porter, Monroe, aged 33, died May 30.

Dr. Phares Allen Boykin, Jeanerette, aged 58, died April 3 of pneumonia.

Dr. Leo A. Wilkinson, Colfax, aged 49, died May 9 in an Alexandria hospital of appendicitis and peritonitis.

Dr. Marcus Clifford Reeves, Vidalia, aged 57, died May 4 of chronic interstitial nephritis.

Dr. Ursin Prejean, Carencro, aged 76, died March 27.

Dr. J. Ernest Brown, Lake Providence, aged 53, died May 6.

MARYLAND

Dr. William A. Frontz, Baltimore, Associate Professor of Urology, Johns Hopkins Medical School, made addresses recently before the Guilford County and Buncombe County (North Carolina) Medical Societies.

Dr. Joseph C. Bloodgood, Baltimore, was a guest speaker recently before the Wake County Medical Society and also at Duke University, Durham, North Carolina.

The annual meeting of the Maryland, Virginia and District of Columbia Medical Society was held recently at Norbeck, Maryland, with the following officers elected for the coming year: Dr. Guy W. Leadbetter, Washington, D. C., President; Dr. Samuel A. Nichols, Clarkesville, Maryland, and Dr. W. Allen Griffith, Berwyn, Maryland, Vice-Presidents; Dr. Robert E. Moran, Washington, D. C., Recording Secretary; Dr. Joseph D. Rogers, Washington, D. C., Corresponding Secretary; and Dr. Robert Scott Lamb, Washington, D. C., Treasurer.

Dr. Dean Lewis, Professor of Surgery at Johns Hopkins Medical School, and Dr. Hugh H. Young, Clinical Professor of Urology, Johns Hopkins Medical School, both of Baltimore, were honored recently when their portraits were presented to the Medical School by colleagues, friends and former students of the physicians.

Dr. William H. Welch, Baltimore, Director Emeritus of the Institute of the History of Medicine at Johns Hopkins, had the honorary degree of Doctor of Science conferred upon him by New York University at its commencement exercises in June.

Dr. Valcoulon L. Ellicott, Baltimore, has succeeded Dr. William T. Pratt, Rockville, as Deputy State Health Officer and full-time Health Officer of Montgomery County.

Members of the Baltimore Health Department have formed a committee to arrange for a memorial to Dr. C. Hampson Jones, for many years Health Commissioner of Baltimore, which will be placed in the Health Department offices.

Dr. Clarence William Peake, Baltimore, and Miss Mary Elizabeth Bouis were married June 15.

DEATHS

Dr. John Wade, Baltimore, aged 68, died June 2.

Dr. Alexander Brown Kalbaugh, Western Port, aged 48, died suddenly May 15 of coronary embolus.

Dr. W. Oliver McLane, Frostburg, aged 63, died suddenly May 14 of heart disease.

Dr. Sidney A. Stokes, Cornersville, aged 69, died May 19 of heart disease.

Dr. Granville Hampton Richards, Port Deposit, aged 48, died May 10 of heart disease.

Dr. Silvanus Blanchard Newton, Chevy Chase, aged 61, died April 30 of streptococcus septicemia.

Continued on page 26

USE

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Continued from page 894

MISSISSIPPI

Newton Infirmary, at Newton, had graduation exercises recently for its nurses who were completing their three years' training course.

The following Pike County physicians have recently returned from Tulane University, New Orleans, where they have been studying for the past four months: Dr. J. E. Brumfield, Magnolia; Dr. J. M. Smith, Magnolia; Dr. W. C. Hart, McComb; Dr. E. M. Givens, McComb; Dr. L. W. Brock, McComb; Dr. T. E. Hewitt, Summit; Dr. W. S. Lampton, Magnolia; and Dr. W. M. Biggs, Osyka.

Dr. C. A. Everett, Bude, has taken over his duties as Surgeon and Superintendent of the Natchez Charity Hospital.

Dr. H. L. Shannon has moved from Clarksdale to Longwood to practice medicine.

Dr. Andrew G. Payne, Dr. Jerome B. Hirsch and Dr. O. H. Beck, all of Greenville, announce the removal of their office to the Weinburg Building.

Dr. G. Lamar Arrington, Meridian, has been appointed Superintendent of Matty Hersee Hospital, Meridian, and has named Dr. C. J. Lewis, Meridian, Assistant Superintendent, and Dr. R. L. Donald, Meridian, Resident Physician.

The North Mississippi Medical Society held its quarterly meeting at Holly Springs in June.

At a recent meeting of the Harrison-Stone-Hancock Counties Medical Society the President, Dr. C. M. Shipp, Bay St. Louis, named the following physicians as Editor of his respective county: Dr. G. F. Carroll, Biloxi, for Harrison County; Dr. D. H. Ward, Bay St. Louis, for Hancock County; and Dr. S. E. Dunlap, Wiggins, for Stone County.

DEATHS

Dr. Clarence E. Hutchinson, Ocean Springs, formerly of Pensacola, Florida, aged 50, died April 24.

Dr. Ernst Erstling, Centreville, aged 65, died April 23.

Dr. William Iverson Marsalis, Centreville, aged 59, died recently.

MISSOURI

At the recent annual meeting of the Missouri State Medical Association Dr. Joseph W. Love, Springfield, was installed as

Continued on page 28

PYRIDIUM

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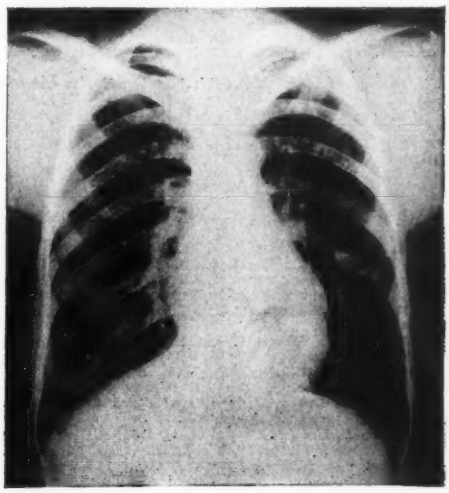
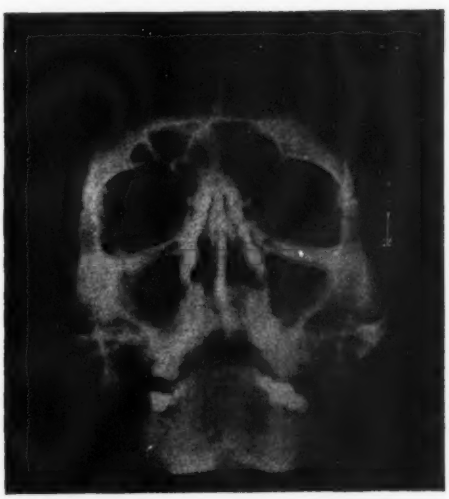


Typical case wherein chest radiograph (above) appears negative, yet radiograph of the sinuses (below) reveals infection of one antrum.



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Continued from page 26

President; and the following officers were elected for the coming year: Dr. W. L. Allee, Eldon, President-Elect; Dr. Elsworth S. Smith, St. Louis, Dr. O. S. Gilliland, Kansas City, and Dr. R. W. Hogeboom, Springfield, Vice-Presidents; Dr. E. J. Goodwin, St. Louis, reelected Secretary-Editor; and Dr. G. W. Hawkins, Salisbury, reelected Treasurer.

Dr. Otto H. Schwarz, St. Louis, was elected Secretary of the American Gynecological Society at its annual meeting in Quebec, Canada.

The Mid-west Hospital Association held its sixth annual meeting in St. Louis in June.

Dr. Kenneth Coonse, Columbia, was elected by the Committee on Scientific Exhibits for the Jefferson City meeting as Chairman of the fracture and orthopedic division of the scientific exhibits.

Deaths

Dr. Frank Albert Bagley, Weston, aged 29, died May 6 of heart disease.

Dr. E. L. Rhodes, Lincoln, aged 81, died May 7 of senility.

Dr. Judson D. Irwin, St. Louis, aged 79, died April 20 of carcinoma of the pelvic colon.

Dr. John W. Crabtree, Harrisonville, aged 62, died April 27.

Dr. Frederick William Bechtold, St. Louis, aged 48, died May 16 of heart disease.

Dr. Edgar A. P. Briney, Bloomfield, aged 71, died April 27 of cerebral hemorrhage.

Dr. Chalmers P. Woodruff, St. Louis, aged 89, died May 5 of cerebral hemorrhage.

Dr. Edwin K. Statler, Jackson, aged 52, died March 29 of tuberculosis of the lungs.

Dr. Corwin F. Howard, Deepwater, aged 76, died April 9.

Dr. Elihu Ashby Fluesmeier, Wright City, aged 61, died May 4 of heart disease.

Dr. Moses B. Harutun, Joplin, aged 65, died May 19 in a St. Louis hospital following an emergency operation for intestinal obstruction.

NORTH CAROLINA

Dr. G. W. Kutscher, Asheville, held a Pediatric Clinic at the Davis Hospital in Statesville the first part of July.

Dr. William deB. MacNider, Chapel Hill, Professor of Pharmacology in the University of North Carolina, is the newly elected President of the American Pharmacological Society.

Dr. J. B. Bullitt, Chapel Hill, was elected President of the North Carolina Academy of Science at its recent meeting at Wake Forest College.

Dr. Thurman D. Kitchin, President of Wake Forest College and Dean of the Department of Medicine, had the honorary degree of LL.D. conferred upon him by Duke University.

The new nurses' home at Duke Hospital was opened in June for occupancy.

Dr. Greene L. Rea, Charlotte, has been appointed acting Health Officer to succeed Dr. Wilbur A. McPhaul, who has become Health Officer of Pensacola, Florida.

The Eighth District Medical Society met in Greensboro in May and elected the following officers for the coming year: Dr. Charles A. Julian, Greensboro, President; Dr. Wingate Johnson, Winston-Salem, Vice-President; and Dr. Thomas C. Redfern, Winston-Salem, Secretary and Councilor.

Deaths

Dr. Joel A. Cooper, Bryson City, aged 84, died February 11.

Dr. Roger A. Smith, Goldsboro, aged 73, died May 23.

Dr. Jefferson Bostwick Councill, Salisbury, aged 76, died April 21 of lymphosarcoma.

Dr. Ralph S. Stevens, Princeton, aged 47, died May 20 of heart attack.

Dr. W. B. Pritchard, Faison, aged 69, died in June.

Dr. Joel A. Cooper, Bryson City, aged 84, died February 11.

OKLAHOMA

At the annual meeting of the Oklahoma State Medical Association in Tulsa Dr. Robert M. Anderson, Shawnee, was installed

Continued on page 30

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Continued from page 28

as President; and Dr. Tracey H. McCarley, McAlester, was elected President-Elect.

Dr. E. D. Rodda, Okmulgee, has returned to his practice after nine months of study in Vienna.

Dr. W. M. Leslie, Blackwell, was host to the Kay County Medical Society for a recent meeting.

The State Health Department made arrangements for a follow-up clinic for Waynoka during the first part of July.

Dr. Claude S. Chambers, Seminole, has been elected President of the Seminole Rotary Club.

DEATHS

Dr. William Lenox McWilliams, Miami, aged 66, died April 6 of angina pectoris.

Dr. James William McCray, Oklahoma City, aged 76, died April 6.

Dr. Edward S. Gooch, Lawton, aged 62, died April 14.

Dr. Andrew Warren Harris, Muskogee, aged 56, died May 26

SOUTH CAROLINA

Mrs. H. M. Markwell is the newly appointed Superintendent of Dr. J. W. Jervey's Hospital, Greenville.

DEATHS

Dr. Winchester C. Smith, Williston, aged 77, died May 28 in an Augusta hospital.

TENNESSEE

At the forty-first annual meeting of the West Tennessee Medical and Surgical Association held in Jackson in May, Dr. William Oscar Baird, Henderson, was elected President; and Dr. Isaac A. McSwain, Paris, reelected Secretary.

Dr. Willis C. Campbell, Memphis, was a guest speaker at the recent meeting of the West Tennessee Medical and Surgical Association.

The Gibson County Medical Society held a meeting in Trenton

Continued on page 32

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When the piston of the syringe begins to stick, the operator simply turns the valve cock to the solution inlet. A slight traction instantly rinses the syringe and valve with saline solution. Thus no delay, no changing of syringe, no excitement to donor or recipient.

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Continued from page 30

in May with an attendance of fifty physicians, among whom were several visitors from near-by counties.

The Montgomery County Medical Society was host recently to two Kentucky societies, Christian County and Todd County. Dr. Virgil E. Simpson, Louisville, and Dr. M. A. Gilmore, Hopkinsville, read papers on this occasion.

Dr. Oval N. Bryan, Nashville, is the newly elected President of the Middle Tennessee Medical Association.

Dr. Carl W. Brabson has moved from Greeneville to Limestone.

Dr. Richmond McKinney, Memphis, is the newly elected President of the American Bronchoscopic Society.

Dr. William G. Stephenson and Miss Mamie Louise Barnes, both of Chattanooga, were married June 15.

DEATHS

Dr. Walter C. Goss, Johnson City, aged 61, died May 12 of nephritis.

Dr. James E. Goldsby, Gleason, aged 72, died in May.

TEXAS

The U. S. Psychiatric Hospital at Waco, with a capacity of 630 beds, was formally dedicated and opened for occupancy in May. Dr. Harry S. Rubin is Medical Officer in Charge.

The Medical School of the University of Texas, Galveston, recently held dedication ceremonies for three new buildings just completed on the University campus.

Dr. Edward H. Cary, Dallas, delivered the graduating address at the University of Arkansas School of Medicine, when the degree of Doctor of Medicine was conferred on forty-six members of the senior class.

Dr. Alonzo Garwood, New Braunfels, has resigned as Health Officer, on account of ill health, after more than thirty years of service in this office.

Dr. Herbert G. Pfeiffer and Miss Alma Ressmann, both of Fredericksburg, were married in May.

DEATHS

Dr. Jasper J. Bland, Beaumont, aged 81, died March 30 of pneumonia.

Dr. William Thomas Jones, Fort Davis, aged 79, died April 26 in Galveston.

Dr. James Slaughter Steele, San Antonio, aged 61, died April 17 of pyelonephritis.

Dr. William M. Ellis, Blooming Grove, aged 67, died May 8 of heart disease.

Dr. Enoch Melville Williamson, Dallas, aged 74, died May 7 of angina pectoris.

VIRGINIA

The Virginia Society of Otolaryngology and Ophthalmology held its annual meeting at Virginia Beach in May. The following officers were elected for the ensuing year: Dr. Frank Smart, Norfolk, President; Dr. Charles St. Clair, Bluefield, West Virginia, Vice-President; and Dr. H. Grant Preston, Harrisonburg, reelected Secretary-Treasurer.

Dr. Joseph Bear, Richmond, announces the limiting of his practice to obstetrics and women's diseases.

Continued on page 34

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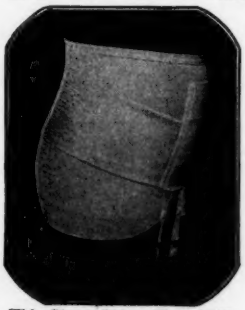

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Continued from page 32

Dr. Booker Lee, Roanoke, has moved into new offices in the Shenandoah Life Building, where he will continue to practice diseases of the eye, ear, nose and throat.

Dr. John A. Hawkins, Danville, has bought the hospital in Danville, formerly owned by Dr. Thomas Wister Edmunds, and is operating it as the Danville General Hospital.

The Norfolk County Medical Society has elected the following officers for the coming year: Dr. Joseph D. Collins, Portsmouth, President; Dr. W. P. McDowdell, Norfolk, Vice-President; and Dr. Lockburn B. Scott, Norfolk, Secretary-Treasurer.

Dr. Benjamin E. Hunt has located in Newport News for the practice of obstetrics.

Dr. James C. LeFon has located at Dunbarton, Richmond, R.F.D., for general practice.

Dr. Thomas Hal Clarke, Jr., formerly of Thorpe, West Virginia, has located in Christiansburg for general practice.

Dr. Robert F. Gillespie has located at Lebanon for general practice.

Dr. Grant R. Elliott, who has been interning at the U. S. Marine Hospital, Norfolk, is now located at Orange, where he is doing general practice.

Dr. Randolph L. Anderson, Richmond, and Miss Ruth Grove were married June 30.

Dr. Delbert T. Saffer, Aldie, and Miss Martha Garnett Gresham were married May 15.

Dr. George Russell Maloney and Miss Emilie Littlepage, both of Richmond, were married May 16.

Deaths

Dr. Anna Moon Randolph, Hampton, aged 67, died April 8.

Dr. Charles Rollin Grandy, Norfolk, aged 61, died June 10.

Dr. Thomas Jackson Sims, Newport News, aged 69, died June 9 of cancer.

Dr. William Thomas Warriner, Crewe, aged 88, died June 5.

Dr. George Bonaparte Wood, Sr., Emporia, aged 74, died June 9.

Dr. Leonard A. Slater, Richmond, aged 63, died May 19.

Dr. Albert Montgomery Dupuy McCormick, Berryville, aged 66, died April 20 of coronary thrombosis

WEST VIRGINIA

The Brooke County Medical Society, at a recent meeting, elected the following officers for the coming year: Dr. J. P. McMullen, President; Dr. F. L. Matson, Vice-President; and Dr. W. A. MacDonald, Secretary-Treasurer; all of Wellsburg.

Dr. George M. Lyon, Huntington, is the newly elected President of the American Pediatric Society.

At the annual meeting of the State Medical Association in Parkersburg officers for the four special sections were elected as follows: Section on Surgery—Dr. B. O. Robinson, Parkersburg, Chairman, and Dr. Frank V. Langfitt, Clarksburg, Secretary; Section on Internal Medicine—Dr. Oscar B. Biern, Huntington, Chairman, and Dr. G. R. Maxwell, Morgantown, Secretary; Section on Pediatrics—Dr. George M. Lyon, Huntington, Chairman, and Dr. M. F. Peterson, Charleston, Secretary; Section on Eye, Ear, Nose and Throat—Dr. O. H. Bobbitt, Charleston, Chairman, Dr. C. E. Park, Parkersburg, Vice-Chairman, and Dr. Harry V. Thomas, Fairmont, Secretary.

Deaths

Dr. William P. Love, Flatrock, aged 70, died May 10 of abdominal carcinoma.

Dr. Arnold August Scherr, Keyser, aged 54, died May 27.

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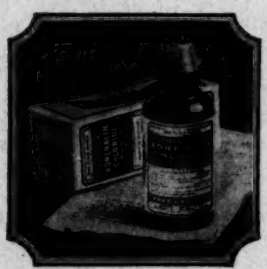

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